THE IRRIGATION AGE.

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THE PROGRESS OF WESTERN AMERICA.

Reclaim The Land The executive committee of the National Business League held a meeting recently at the Wellington hotel, Chicago, and adopted resolutions urging the reclaimation of the arid regions of the West. Charles Truax read a paper on the loss that accrues by exchanging the money of one country for that of another.

Those present were: President Erskine M. Phelps, Vice-president Alexander H. Revell, General Counsel John W. Ela, LaVerne W. Noyes, Colonel Elliott Durand, Charles A. Mallory, Charles Truax, P. W. Gates, Benjamin J. Rosenthal, George H. Maxwell, F. Howard and A. A. Burnham.

The resolutions set forth that one-third of the entire area of the United States is public land, nearly all of which is in the western half of the country. It is estimated that 74,000,000 acres of this vast territory could be reclaimed by irrigation. The expense of irrigation is so great that it will naturally have to fall on the general government, and action on this line is urged in the resolutions.

In Mr. Truax's paper it was claimed that there was need of an international money for the use of travelers.

The Farmers' Combine An organization has recently been incorporated in Kansas known as the Farmers' American Federation, which proposes to benefit the farmer by improving the present method of selling farm products. The capital stock of the new corporation is $20,000 divided into shares of $10 each, and its aim is to secure co-operation among the farmers of the Mississippi valley by their membership in the federation, and thereby to secure better and more stable prices for farm produce, fixing minimum prices for staple farm products based on the average cost of production. The secretary of the federation, in outlining the objects, says: "It is our purpose to establish a bureau of statistics, giving information regarding farm products and their prices in the market; to place farmers in control of the elevators, warehouses and stockyards, and put them in full control of the marketing of their own products; to put farming on a business basis, make provisions for failure of crops, add the cost of insurance and risks to the price of the products we offer for sale, and to secure the practice of equity in trade relation between all organized industries."

The objects are very fine theoretically, but whether they can be put into practical operation is another question. The *Milwaukee Sentinel* says: "It is obvious that the federation will have great difficulties to overcome before it can be made successful. The present established methods of handling farm products must be almost completely superseded before it can expect to regulate prices. This means that there must be co-operation on the most extensive scale among the farmers of the country. Besides, there must be the most intelligent and honest management of the affairs of the federation in order to assure good results. The objects in view are no doubt excellent, but to attain them seems little short of impossible."

The Galveston Horror The recent flood in Texas was the most devastating catastrophe which has occurred in the history of the country. In 1889 people were horrified at the awful disaster at Johnstown, when it is estimated, over 2,000 person's perished: more recent was the cyclone at St. Louis, with its awful destruction of property and the loss of over 700 lives; but the Gulf storm was far greater than either of these in the appaling loss of life and property. It is estimated that in Galveston alone at least 3,000 perished, while the total loss of life in the storm center will probably reach 10,000. Many of the citizens of Galveston realized for years the inadequency of the protection against the ocean storms, and often spoke of the probability of a calamity happening, but regarded it as a far off contingency, as we do death. It came upon them almost without warning, and the city is now a vast ruin. Doubtless the same American pluck and energy which made it possible to rear a newer and better Chicago on the ruins of the old in 1871, will rebuild Galveston and put about it such protection from the ocean as the recent disaster has shown is needed. In the horror of this tragedy there is one bright spot, and that is the willingness—nay eagerness, shown on the part of other cities to give aid to Texas. Johnstown in her time of trouble received $2,000 from Texas and now offers to pay this sum back with interest, $5,000 being the amount contributed. Chicago, New York, Indianapolis, St. Louis—all were ready with money and provisions as soon as possible, while the railroad companies showed their generosity by offering to transport freight free of charge to the sufferers. There was no red tape, no delay, but a prompt offer of help.

Fitz and The Cigarette Col. Robt. Fitzsimmons, who has announced his intention of retiring permanently from the ring, recently gave utterance to sentiments regarding the cigarette, which should receive wide publicity. A word from a great pugilist will carry more weight with the average small boy, who looks up to him as a hero to be admired and emulated, than will the lectures of instructors or the tears of mothers. Fitzsimmons attributes his health and strength in his accumulating years to temperate living. He says: "Drink, late hours, cigarettes in youth—those things make men old. I would as soon learn to crochet as to smoke a cigarette. If a man criticised me for crocheting I could give him some kind of an answer, or at least give him a punch for criticising. But if he caught me smoking a cigarette, I'd have to confess that I had gone wrong." If the boys could read this and be taught that cigarette smoking is something contemtible; that it is despised by "manly" men, perhaps there would be fewer stunted old-young men, who are victims of this pernicious habit. To compare cigarette smoking with crocheting is to make it savor of weakness, and therefore to be despised by young Americans whose aim is to do "what the men do." Fitzsimmons should receive a vote of thanks for thus boldly defining his position on the question and giving his influence against the little "coffin-nails."

MILLIONS APPROPRIATED FOR LEVEES.

By Guy E. Mitchell.

The history of levee construction on the Mississippi river has been a long one. The first levee was begun in 1717, which was, when completed, one mile long, erected to protect New Orleans, then a mere village. This levee was four feet high and eighteen feet across at the top. It was not, however, until after Louisiana had been ceded to the United States that levee construction was begun on a large scale—an enlarged and systematic scale. As the work progressed up the river and additional basins and bottoms were enclosed, the levees necessarily increased in height. The average height of the levees in Louisiana, above New Orleans, in now between twelve and thirteen feet, and this height proved insufficient in the great flood of 1897. This flood indicates to the official engineers that three or four feet additional will be required.

Millions and millions of dollars have been appropriated by the Federal Government for the building of these levees and other constructions intended to protect the surrounding country from floods, and millions more must be appropriated by every Congress to come unless other steps are taken to prevent these floods. The measures of the government are merely palliative; they do not go to the root of the evil. The report of Captain Hiram Chittenden, of the Government Engineer Corps, however, shows that there is a way to strike at the trouble itself, and largely prevent the floods instead of trying to enclose them between banks after they have become such.

He shows in his official reports that, by the building of a series of great storage reservoirs at the head waters of the Missouri, floods can be prevented through the diverting of the excess of waters into these artificial lakes. Surely this is something for Congress to give its attention to. Here is a practical plan. An ounce of prevention is worth a pound of cure. Congress will go ahead appropriating millions every session for flood prevention without a question, but it will not appropriate the same amount for a plan, which, according to the government's own engineers, promises far greater results. Of course, the storing of these reservoirs would mean the reclamation of large tracts of land to irrigation; but this need not worry Congress, even in eastern members, for the eastern merchants are already alive to the situation, and realize that the reclamation of the arid West would open to them the finest market in the world.

THE NATIONAL IRRIGATION POLICY.

The opponents of the national irrigation movement seems imbued with two ideas. First, that national irrigation is a matter of flight and fancy about which all sorts of extravagant, unauthenticated, and theoretical statements are made by its advocates, and, second, that whatever the scheme may be, the people of the East will never endorse it. Neither of these ideas is founded upon fact. The national policy is not a plan reared upon fancy, but a legitimate problem entirely capable of performance, as shown by the recommendations of the best government engineers of the various departments at Washington. The friends of national irrigation want nothing more than that the recommendations of these engineers shall be carried out. And if this is done there can be no other possible outcome than that the population of the country lying between the Missouri and the coast will be vastly increased with resulting prosperity. The waste waters of the West, if stored, would create a permanent source of wealth to the nation.

And the eastern opposition to western reclamation is getting to be more of a myth than a reality since the crusade has been started throughout the manufacturing states calling attention to the vast possibilities which lie to manufacturers through the development of the arid West in giving to them the best market in the world for their goods. It is well enough for the opponents of the national irrigation policy to talk of unalterable eastern opposition to the scheme, but the fact is that the East contains thousands of the strongest and most influential supporters which the movement claims.

Intimately connected with the conservation of water for irrigation is the preservation of forests. Every irrigated valley and the supply of every storage reservoir is dependent upon forested tracks which will absorb rainfalls and gradually let it out through streams and springs.

Primitive man did not at first begin his agricultural operations by irrigating great valleys and plains. He commenced, perhaps, with a small patch of ground and a little stream of water, or planted his simple crops on the edge of the desert, utilizing the water of some small but perennial spring, or laboriously drew it from a well. Then later he learned to broaden his operations and work in communities, until finally he undertook great projects and accomplished engineering feats in the construction of canals, viaducts, and complete systems which have hardly since been surpassed by modern capital and ingenuity.

AN UNWATERED EMPIRE.

The vista that the possibilities of irrigation reveals, say the Los Angeles *Herald*, is almost stupendous, as a few facts and figures prepared by the National Irrigation Association demonstrate. The Fed-

eral Government today owns 100,000,000 acres of land, which is worthless only because it is arid. This "unwatered empire" can be reclaimed by irrigation and rendered capable of sustaining a population of at least 50,000,000 people. In the words of the Secretary of Agriculture in his last annual report: "More than one-third of the country depends upon the success of irrigation to maintain the people, the industries, and the political institutions of that area, and the future growth will also be measured by the increase of the reclaimed area. In a region which, in the extent and diversity of its mineral wealth, has no equal on the globe, the riches of the mines in the hills are already surpassed by the productions of the irrigated farms in the valleys, and the nation at large is at last awakening to the fact that the development of the use of the rivers and arid lands of the West will constitute one of the most important epochs in our increase in population and material wealth."

These stupendous possibilities also present a colossal problem. How may this gigantic desert be transformed into a land of prosperity? Who is to redeem the national domain by a comprehensive system of reservoirs? It has been demonstrated by twenty years of experience in irrigation development and by the reports of Government experts and engineers that the great problem can only be solved by the Federal Government. Capt. Hiram M. Chittenden, Engineer Corps, U. S. A., in his report on "Surveys for Reservoir Sites," declares emphatically that reservoir construction in the regions of the West can properly be carried out only through public agencies. "Private enterprise can never accomplish the work successfully. As between state and nation, it falls more properly under the domain of the latter."

It is estimated that $143,000,000 would reclaim the arid lands of the West; that an expenditure by the Federal Government of $15,000,000 a year for ten years would open up lands for the settlement of a population as big as that of the entire country at present. An appropriation of $100,000 was made at the last session of Congress for preliminary surveys to discover the best locations for the immense reservoirs.

The assistance of every organization and of every individual in forwarding this all-important work should be welcomed and assisted in every possible way by the citizens of California, who will substantially derive more benefit from its consummation than the inhabitants of any other section of the country.

"The National Irrigation Association," continues the *Herald*, "is doing most valuable work in awakening interest throughout the country, East and West, in the cause. The policy that the association advocates is, in brief, that the Federal Government shall build, wherever necessary, the irrigation works required for the reclamation of the arid public lands, reimbursing itself from sales of the land

reclaimed; and that a fair share of each river and harbor bill shall hereafter go for building storage reservoirs. To carry out such a policy requires an effective national organization, which can only be realized by active and general support. Commercial organizations are asked to endorse this policy and co-operate with the National Irrigation Association. Personal co-operation and membership in the association are necessary for the success of the movement."

NATURAL RESERVOIRS.

Congress has for years been appropriating money for storage reservoirs in the West. This may seem like news to many, but it is a fact with which they are in reality familiar. Long ago the legislative branch of the government recognized the fact that it is the duty of the government to protect forests and to reforest such districts as are burnt over, to the end that the water supply shall not fail. In other words, where the government appropriates for the protection of a forest or the reforesting of a tract of land, it appropriates for the building of or the care of a storage reservoir. The forests are nature's reservoirs, and if it is economical and proper for the government to recognize and care for them, why is it not equally proper that it should build artificial reservoirs which would save to the country the millions of dollars which now annually sweep to the sea through the waste and flood waters of countless rivers?

SHAMEFUL TREATMENT.

According to recent Phœnix, Ariz., dispatches, some of the Pima Indians at the Sacaton agency have threatened violence and rebellion if their children are forced to attend school. Before this time the trouble has been adjusted or suppressed, but in truth it would seem strange if these Indians refused to send their children to school or to believe any word the whites may tell them. Of all the Indians of the West, they, the most peaceful, friendly and industrious, have been treated the worst by the government.

These Indians have always been irrigators—were such at the time of early Spanish explorations – and some dozen years ago the importance of protecting or increasing their water supply was brought forcibly to the attention of the Washington officials, and it was urged that something be done to prevent their being cut off from the water supply which they had used from time immorial to water their little plats of maize, vegetables and orchard.

The matter at the time received the grave consideration of the department, and since that time it has been referred back and forth from the office of Indian Affairs to the Indian Division of the Interior Department and back again, and then, under the spur of some outside pressure, to some special agent for a report, and so on. The numerous reports made and printed on this case would fill a shelf. In the meantime the condition of the Indians has grown steadily worse;

practically all of their water supply has been diverted by white settlers, and they, the original owners, have been reduced to actual starvation. Last Congress appropriated $30,000 to feed them—$30,000 to feed a free and independent people, heretofore relying only upon their labors,—industrious, and asking nothing of anybody.

But why bother these department clerks about such a matter. They have sat at their desks probably for twenty years and they know best how to do things. When the report comes in of Inspector Graves, who has been sent down to the Pima agency to tell the same old story in new words, it will be then time to—label and pigeon-hole it.

It might be well, however, for the Secretary of the Interior to himself inquire a little into this matter, and not act entirely on the recommendation of bureau and division clerks, who apparently desire never to see any definite relief provided. This case of the neglect and abuse of the Pima Indians has just about reached the straining point.

THE IRRIGATION PROBLEM OF VAST PROPORTIONS.

Hydrographer Frederick H. Newell, of the Geological Survey who is making a general tour of the West in the interests of irrigation matters, combines not only exhaustive knowledge of his work with indefatigable activity, but takes an interest in western development amounting to nothing less than great enthusiasm. He usually spends much time during the summer season in traveling through the western states, and during the winter months delivers a goodly number of lectures in eastern cities, descriptive of these travels. In this manner the western country with its illimitable possibilities and vast resources gets an eastern advertisement which must be of great benefit. Some of Mr. Newell's stereopticon lectures on the great irrigation works of the West are full of interest and carry to easterners some idea of the scale upon which things are done in this part of the country. Mr. Newell anticipates the rapid strides in the work of irrigation during the next few years, but he gives some excellent advice in an interview on the subject of the progress possible.

"The problem of the complete reclamation of the desert lands," said Mr. Newell, "is too big for individual or corporate enterprise. The government must reclaim these new fields, which will be the richest in the world, as it now, by spending millions of dollars, seeks to save the productive lands of the lower Mississippi valley. The manufacturing East is now beginning to gladly support such a policy since its possibilities are being properly exploited. The West, however, must look ty its representatives in Congress to press matters in the most practical manner, and it must send the right kind of men to Congress.

"The surveys we are now making will furnish facts upon which recommendations to Congress can be made, and behind the work of the congressmen, there should be the strong backing of the organized business interests of the West."

ELWOOD MEAD ON IRRIGATION.

[Read at the Farmers' Congress, Aug. 21.]

Elwood Mead of the United States Department of Agriculture, delivered an address on irrigation. He said in part:

"As the result of less than a half century of effort and experience, irrigation has changed arid, desolate plains producing nothing but cactus and stunted grass, into orchards and gardens, created cities like Salt Lake and Los Angeles, and dotted with rural homes, many valleys where once the live stock industry was supreme. From being an experiment there is not now an arid state or territory in which the products of the irrigated farms do not rival in value those of the mines or factories. Looking at these achievements the question may well be asked whether or not there is any need of state or national aid to promote the success of this industry. If people, to whom at the outset the whole subject was strange and new, have succeeded so well, cannot the complete utilization of western land and western rivers be left to unaided private effort?

"It is the opinion of those best informed that the present haphazard development cannot continue. The area now irrigated is now larger than the state of New York, every acre of which has been watered from one to six times each year. The canals and literals which distribute this water are many thousands of miles in length, and require in their management during the growing season an army of men to protect and regulate headgates, patrol their banks and adjust the measuring boxers of users. The success or failure of these canals is a matter of local interest. Much of the money expended in their construction came from the East.

"Already the claims to water amount in the aggregate to many times the supply. Every transaction which has thus far had to do with their disposal has been marked by a lavish prodigality. Ditches have diverted more than was used, the owners have claimed more than they could divert, and the courts have given the claimants titles to more than the ditches could carry and often many times what the highest floods would supply. In the absence of definite information of the quantity needed to irrigate an acre of land, or of the volume which streams will furnish, the ignorance or greed of the speculative appropriator has its opportunity.

"We can most surely end this state of things by showing how much water is needed and when it is used. To do this on a large scale is expensive. To have the results accepted as a guide to legislation and as a basis for the important transactions, they must be made by men of capacity and experience and cover a wide range of

country and conditions, and they must be absolutely freed from local or selfish influence. All these mark the study as one which the general goverment can carry on more effectively than any other agency.

"The public, East and West, has another interest in this investigation. There are many million acres of irrigable land yet to be reclaimed. This land is a public trust and the opportunity of future home seekers. In order to know how much can be safely offered to settlers we must know how much water each stream will supply, and how much an acre of land requires. The government should provide this information as a guide to honest enterprise and protection from unscrupulous ones. Sooner or later a knowledge of the duty of water becomes a necessary in every irrigated district. It is required to settle disputes over water right contracts and provide for their intelligent reconstruction. It is needed by law makers in the framing of laws for the establishment of water rights and by the courts in rendering decisions.

"The issue as to whether western rivers are to remain a public trust or become personal property is being waged with a vigor commensurate with the value of the property. The result will determine whether irrigated agriculture will become corporate or co-operative. Personal ownership creates an opportunity for monopolies more absolute and oppressive than any now existing. Those who do not object to the free grants of perpetual franchise in cities, will approve of the free and perpetual surrender of the water of streams. It is my belief that both are alike unwise.

"The time to settle which of these two policies should prevail is during the early year of our development, in the pregnant years when institutions are forming and before mistakes or abuses have become fixed by time or custom. There are two agencies which should be enlisted in this work. The national government should study the irrigation systems of the different states and of other countries, as the governments of Canada and Australia are now doing. This the office of Experiment Stations has begun. Some of the most equable and experienced students of irrigation are now making, under its direction, a careful investigation of the irrigation systems of Utah and California. Their reports when printed will show in concrete form what sort of water ownership now prevails and the merits and defects of the systems now in use. It is the intention to extend these studies to other states in order that legislatures may profit by the experience of neighboring commonwealths, This, however, is not enough. The problems of today will not be the same tomorrow. With growing and increasing scarcity there will be a constant evolution in water laws. The next generation of irrigators should be educated to deal with them. A course of instruction in the social and industrial features of irrigation should be provided in every western university. A number of agricultural colleges, Colorado being especially entitled to com-

mendation, are rendering valuable service to the West by their instruction in irrigation engineering and an investigation of its problems. This should be supplemented by equally thorough instruction in the laws and methods which should control the ownership and distribution of streams. If Jefferson was right in believing that one of the functions of universities is to form the statesman, legislators and judges on whom public prosperity and individual happiness so much depends there is no question that the state universities of the arid region can in no way more effectively serve the commonwealths which support them than by instructing their students in the principles which should govern the disposal of the commodity which is destined to exercise a larger influence over the prosperity and growth of the western third of the United States than all other influences combined.'

The splendid work which Elwood Mead and his assistants are doing throughout the West along irrigation lines, is becoming well known. As state engineer of Wyoming, Mr. Mead achieved for his state such an enviable reputation throughout the irrigated region that his broader work of investigation under the general government is meeting with much favor and is being watched with deep interest. His first annual report on "Irrigation Investigation" is just issuing and will be found of great value to the West.

It deals with the methods in use in the arid states in the distribution and use of water in irrigation, and gives a large number of measurements made to determine the duty of water, the losses from seepage and evaporation in canals, and describes the methods by which the water supply may be more effectively and economically applied to crops. It contains papers discussing the results of the year's investigations by Elwood Mead, expert in charge, Clarence T. Johnston, assistant, and reports and discussions by special agents Thomas Berry, Colorado; W. M. Reed, New Mexico; W. H. Code, Arizona; W. Irving, California; R. C. Gemmell and George L. Swendsen, Utah; D. W. Ross, Idaho; Samuel Fortier, Montana, and O. V. P. Stout, Nebraska. It is illustrated by views, diagrams and maps showing the location and character of the investigations made.

"The investigation," says Mr. Mead, "deal with problems which sorely perplex the irrigators and canal builders of the arid West. Their comprehensive study is a new feature of national aid to irrigation development in this country. Heretofore the leading object of such aid has been to promote the construction of new canals, to show how much land there was above existing ditches which could be reclaimed, and the benefits which would come from such reclamation. It is believed that this investigation also will tend to secure these ends, but its primary purpose is to promote the welfare of the people living under the ditches already built, to render the farms now irri-

gated more profitable, to lessen the controversies over the distribution of water and secure its more systematic and economical use."

During the year that Mr. Mead has had the work of irrigation investigation in charge a great number of measurement have been made of water used for irrigation at the heads of the large canals, at the heads of the small canals or laterals and also at the margins of the fields when used. These measurements show in many cases a surprising discrepancy. The differences in the measurements at the three places show the approximate loss of water in transit in canals. The results which are given in full in Mr. Mead's report are expressed in the depth to which the water measured would cover the land irrigated, provided it all reached the land. The table below gives the averages of the three classes of measurements.

	Depth
Measured at the heads of large canals	2.63 feet
Measured at the heads of large canals and laterals	2.40 feet
Measured at the margins of fields when used	1.29 feet

The causes assigned for these immense losses are improper construction, the nature of the soil through which the canals pass, and the practice of placing checks in canals to throw water on land too high to be irrigated without their use. The report of the work on the Gage Canal in California shows that practically all these losses can be stopped when the value of the water will justify the necessary expense. This saving would enable many existing canals to *irrigate double the area now reclaimed.*

Serious losses from evaporation do not occur in main canals, but from the fields where water is distributed. During the midsummer season the continuous sunshine heats the surface of the ground to a very high temperature. A test made last summer by the government irrigation man, showed the surface soil in southern California to have a temperature of 120 degrees F. When a thin layer of water is spread over land thus heated, as it is frequently done when flooding is practiced, the loss from evaporation must be excessive. Mr. W. M. Reed discusses this in his report on New Mexico, showing instances where it has become so great as to entirely consume the volume supplied. Irrigators know by practice how much faster an irrigation head of water travels over fields at night and in the early morning than during the afternoon. This is due to the difference in the rate of evaporation. In order to lessen this loss it is important that fields be irrigated as quickly as possible. To do this each irrigator should be supplied with all the water he can distribute. Where only a small stream is used, progress is slow, the soil next the laterals is saturated; it is hard work to reach the high spots while the low ones are over irrigated by the delay this causes.

Contracts which provide for the delivery of a uniform constant flow are, as a rule, wasteful of water. Contracts which charge for the

acres irrigated, without regard to the volume used on these acres, are a temptation to extravagance on the part of the irrigator. On the other hand, contracts providing payment proportioned to the quantity delivered and for delivery in amounts which can be most efficiently distributed, cannot fail to lead to economy in the use of water, and consequently to a high duty. Under such a system the irrigator is benefitted by his saving and pays for his waste. Such contracts can only be employed in connection with a system of rotation in delivery to irrigators. This rotation benefits the canal company as well as the irrigator, because it lessens the loss from evaporation and seepage. If a canal is large enough to supply 100 farms it will still supply them whether they are all irrigated every day or one-half given twice the usual supply every other day. On large canals the economy of such rotation is very great. It would permit of dividing canals in sections and supplying the lands under them, one section at a time. A canal 60 miles long could be divided into three sections of 20 miles each, and all the loss from seepage and evaporation on the lower forty miles saved while the irrigators of the upper section were being supplied. In the same way, by keeping the full supply in the canal, water could be rushed through to users under the lower section with less loss than where the flow is depleted by laterals along the route. The greatest saving in rotation, however, would be made in the laterals. Where water is permitted to slowly dribble through continuously the waste is enormous. By devising a system for grouping the laterals and inducing the irrigators therefrom to take water by turns, the engineer can do as much toward raising the duty obtained as the actual cultivator.

The co-operation of the western states with the Department of Agriculture in making this broad investigation of the duty of water will be of immense value just now when the time is ripe for a western awakening which will induce the government to enter into actual appropriations for the construction of irrigation works which will place under cultivation vast additional areas. It is important that all the light possible should be thrown upon the subject.

FOR NATIONAL IRRIGATION.

EASTERN INTEREST IN ITS POSSIBILITIES IS GROWING.

Evidence comes to show that the national irrigation movement is not dead, but that on the contrary it has taken a firm hold, particularly of the people of the East, where opposition has been the strongest. On the 17th of August, the Missouri Press Association adopted ringing resolutions pledging itself to urge upon congress and upon individual senators and representatives, irrespective of party, the necessity for the construction of storage reservoirs by the federal government in order to redeem Arid America and to control the floods of the Mississippi. The resolutions were comprehensive and broad.

On the same day the National Association of Merchants and Travelers, of Chicago, at a special meeting of their executive committee to decide whether they would take hold of the national irrigation movement, adopted the following trenchant resolutions:

"WHEREAS, the building of great storage reservoirs and canals by the federal government, as advocated by the National Irrigation Association, would transform the great arid region of the west into a fertile territory, capable of sustaining a greater population than inhabits the whole United States today, and would practically double our national wealth and resources, enormously enlarging our home markets and increasing our trade and commerce and the prosperity of the whole people of the United States. Now, therefore, be it

"*Resolved*, That the Federal Association of Merchants and Travelers will give its active and vigorous support to the national irrigation movement, and we urge upon the people of the United States, and especially upon all merchants and manufacturers and commercial organizations in every part of the country that they co-operate in aid of the movement."

The fact is that eastern merchants and business men generally recognize the moment that it is called to their attention, the vast possibilities which open before them, in the reclamation of the arid west through a comprehensive storage reservoir system. It takes no prophet to see that with the opening to settlement of millions of acres of the most productive land in the world and its population by thrifty, industrious and well-to-do farming communities, an immense market, the superior of any in the world and almost at and within our very doors, will be opened to the thousands of American factories looking for places to sell their products, while they in turn would be so stim-

ulated as to make heavy demands upon eastern farmers to feed the hundreds of thousands of their employes.

The more general introduction of irrigation practices in eastern humid regions is a good sign for the arid west, for, with a more general familiarity with the subject, the better it is for that section entirely dependant upon it when it comes to a question of needed legislation. In Louisiana the possibilities of irrigation are great, and for an extremely humid state it has already a comparatively large area under water systems, amounting to something over 100,000 acres, while the annual rainfall of the state is double the average for the whole country, being in the neighborhood of 60 inches, yet Louisiana is subject to the most severe drouths, especially in the spring-time when the crops need moisture. The Mississippi furnishes an unlimited water source for much of the state, and its waters hold in suspension and solution much matter of a fertilizing nature.

New Jersey is another state which furnishes some excellent object lessons on artificial watering, and in Wisconsin, on land receiving its full share of the rainfall of the humid belt, irrigation of small crops has been shown to produce remarkable returns over and above cost of production and watering. The more this sort of development affects the east, the less novel will be the subject and the less opposition will be put forward by the intelligent people of that section to a policy of general western reclamation.

The opponents of federal irrigation admit that it is quite proper for the government to appropriate money for the construction of expensive ripraps and levees for floods to destroy from time to time, in addition to causing vast loss to life and private property; yet that it is wholly wrong to build reservoirs to restrain these floods and thus get at the root of the evil, because the water stored in these reservoirs would be used to irrigate parched fields, and thus we would be adding too much to our productive capacity. Fortunately, the adherents to this narrow proposition are not numerous, and the theory is not growing in popularity.

However wise, just and carefully drawn may be the water laws of a state, they do not afford its residents complete protection, because rivers are bound to flow across state lines, and in such cases only federal control will insure equity.

Forests and storage reservoirs both serve the same purpose, namely, that of keeping the waters from running away from the mountains in spring floods and letting it down gradually during the crop season.

SALVATION ARMY IRRIGATORS.

IRRIGATION ENGINEER FROM THE PUNJAB TO INSPECT AMERICAN METHODS.

The irrigation farms of the Salvation Army are attracting considerable notice. In Colorado the Army has one farm of a thousand acres and is about to add another thousand. It has another farm in California and the movement generally is looked upon as of some economic importance.

Commander Booth Tucker invited his friend E. A. Pargiter, a government irrigation engineer of the Punjab, India, to visit the irrigation farms of the Salvation Army and Mr. Pargiter is now in this country on two years' leave of absence.

"I intend also to study irrigation in the United States for my own benefit," said Mr. Pargiter in an interview at San Francisco. "Methods and conditions here are quite different from in India, where I have been connected with the Public Works for some fifteen years."

Mr. Pargiter upheld the Indian government in its treatment of the famine question. "India" he said, "has reclaimed vast areas through building permanent irrigation works for the watering of arid lands which cannot grow crops without irrigation, and this has wonderfully improved the condition of the people living in those districts. There are now about 5,000,000 acres benefited by a system of irrigation works.

"Irrigation is under government control in India. This has proved by far the most satisfactory method and the best for the people. There have been many large private irrigation projects but the government has found it necessary sooner or later to control them for the reason that investments in large irrigation enterprises do not yield an immediate return on the money and private capital is not willing to wait eight or ten or even fifteen years for an investment to begin to pay. But the government can wait, and finally will secure good interest on its money. Some of the districts return a profit to the government as high as 10 and 15 per cent. Rice and sugar land is charged for irrigation about $3 an acre. The charge for cotton lands is $5. For wheat and barley lands $1 is the charge.

"Irrigation can hardly solve the famine question for the reason that the famines occur in regions where some years there is ample rainfall for the crops. The drouth comes along generally about once in ten years and while an irrigation system would avert trouble in that year, during the other nine years in would not be patronized. The stricken districts have suffered a drought for three years in suc-

ession this time, something which will probably never happen again for fifty or one hundred years. When it rains in those districts there is more than enough of it. Irrigation is then utterly of no use."

"Colorado should be the greatest agricultural state in the West, says the Denver *Times*. In its sandy plains and valleys there is as much gold as in its mountains. The only difference is in getting it out. For the one the plow and the harvester are used. For the other the pick and drill are necessary. Colorado needs more farmers. A thickly settled agricultural region builds up cities. It makes a prosperous state."

And this possibility of upbuilding and development through agriculture will apply to all the great arid west as soon as its land shall have been reclaimed and made productive through the construction of great storage reservoirs and the conservation of the vast volumes of water which now flow uselessly to the sea.

In his last aunual report the Secretary of the Interior, referring to the arid lands of the West says: "That this vast acreage, capable of sustaining and comfortably supporting, under a proper system of irrigation, a population of at least 50,000,000 people, should remain practically a desert, is not in harmony with the progress of the age or in keeping with the possibilities of the future." The federal government should devote a portion of its annual river and harbor appropriation to the building of the great storage reservoirs, the surveys for which have been made by the geological survey.

The extensive regions of northern Mexico, are, it is reported, to be irrigated by canals through aid extended by the Mexican federal and state governments.

THE DUTY OF GIRLS.

By Enoch Dixon.

There are almost as many varieties of girls in the world as there are individuals. No two are exactly alike, yet, if we dispense with the finer distinctions which would prompt a sub-division of the groups, there are but a few general classes. The distinction between these classes is vague, however, and while they are in a measure opposed in character, disposition and inclination, yet one class is really synonymous of the others. The fact is, and we would not have it otherwise if we could, girls are girls. One may be petite and vivacious, hence attractive to some, while the power of another may be in her obesity and timidity. The gift of verbosity, even without reason or logic may insure the popularity of one, while her taciturn sister may have equally as large and as earnest a following. The society butterfly has a no more faithful or devoted cavalier than has the girl who is a product of the slum; the maiden who goes out to domestic service is loved as honestly as the woman who has gained fame in art or music. The girl who teaches a Sunday school class and lives a goodly life may be an old maid when her frivolous friend is a wife—though the man who chose her may not have used commendable discrimination in making his choice.

There is a natural law which causes like to seek like, and another ess commonly enforced, which forges a chain of friendship between the antonyms of character. Generally a girl can be judged by the company she keeps, but sometimes that standard of measurement is at fault. The frivolous may consort with the sedate and each find pleasure in their intercourse—the lewd may attach itself to virtue without revealing itself except to discriminating judges of character, but such cases are rare. They are common enough, however, to prompt caution and charity when passing judgment.

Viewed from the standpoint of worldly wisdom, it is a happy provision of nature that there is a demand for all kinds of girls. The rabble takes what comes its way, careless of character, education and qualifications. Those of the middle class demand virtue and some education, but ask little else. The better class is content only with a combination of all the graces—womanly virtue, developed intelligence, housewifely qualifications, amiability and personal grace. Because of their standing in society and before the world the people of this latter class, being in demand as husbands, have first choice among the marriagable girls and can place the standard where they will. They leave that which does not meet their approval and the middle class has second choice. The culls, if you please, go to the rabble.

The girl, then, practically choses

her own after position in life. She is called to the rank for which she is fitted. True, there may be occasions when the accident of birth may prevent exact justice in the classification, but not often. In the home, no matter how humble, true character will develop. A mask may be worn before the world, but in this day and age the world has a habit of looking behind the mask. It is a discerning world. It readily detects sham and humbug. It distinguishes between carelessness and vice; notes the difference between honorable vivacity and that levity which is prompted by depravity. In its estimate of character it does not often make a mistake, and the daughter of humble parents may incite as much reverence and respect as she who is reared in a more pretentious home or in luxury. The money standard does not measure goodness; the possession of wealth carries with it no monopoly of virtue, intelligence and the womanly graces.

In this age of efficient public schools and splendid public and traveling libraries a good education is possible for any girl who has reasonable aspirations and a little application. In the public schools are opportunities for gaining an education which is ample in all the walks of life except the professions. This may be supplemented by a course of reading, costing nothing, which will include history, biography, travel, fiction and a little science if desired. Thus equipped any girl of average intelligence can carry her part in a conversation on almost any topic, and these intercourses will constantly add to her knowledge.

The daily walk of the girl is of much moment in influencing her fnture life, yet there are so many standards that no ironclad rule can be laid down. What would attract in one instance would repel in another. Above the rabble, however, virtue is always demanded and a gaod name is of first importance. It is an essential element. Even the appearance of evil is a handicap which cannot be wholly overcome. The world is not charitable with this offense. Its judgment is harsh and the decree irrevocable. The girl, then, who would occupy an honorable place in society should be discriminating in selecting her companions and of her every action.

Of much importauce, also, is amiability, that combination of agreeable qualities which win the affections. This power of pleasing is inherent with some, while in others it must be cultivated and beveloped. It is beyond no one. A sour, churlish disposition can be curbed or entirely changed. No nature has not its agreeable and pleasant traits. These, if properly appreciated, can be fostered and in time their softening influence will permeate and transforms the most disagreeable natural inclinations. Sometimes it may be a severe struggle, but "try, try again" is the motto, success must come.

Personal grace is akin to amiability. Its component qualities are graciousness of manner, neatness of dress, cleanliness of person, adaptability and geniality. These need no analytical explanation.

they are pleasingly conspicuous if they exist; shockingly patent if they are absent.

The housewifely qualifications are of prime importance. No true man of the substantial and successful sort loves or wholly respects a girl because of the gaudiness of her apparel or the brilliancy of her smile. He may admire her, but it is much the same sort of admiration he lavishes upon a pretty picture or a plate from a fashion magazine. He would not want her for his own; in the chosing of a wife he would strike her from the list of eligibles. Her nature would not be of the kind that would be sympathetic in times of sorrow; her influence would not be strengthening if he were called upon to meet misfortune. Her influence in the home would not conserve that peace, happiness and quietude which makes of home a retreat from the trials and worries of business.

In preparing for wifehood the girl has a herculean task. She must expect to "love, honor and obey" her husband for an average lifetime of thirty years. During this time there are three meals to prepare each day, three hundred and sixty-five times each year, for the individual whose stomach if not filled or his palate gratified, refuses to be happy or congenial. Added to this are the daily duties of the house, the bearing and bringing up of children and the demands of society to be met. It is a task which in its total is appalling, and for which careful preparation should be made. It is a task which the frivilously inclined do not accomplish and the intelligent man realizes that the possession of housewifely qualifications is a true indication of sterling worth and good quality.

With the acquirement of the virtues herein enumerated any girl of sound mind can fit herself for and rise to the choicest position in the world—that of the wife of an honest, loving, discriminating man She must either do this or become a second or third choice.

PHYSICAL ECONOMICS.

By E. Marguerite Lindley.

Summer is ended. Short skirts have been every woman's bliss whether or not she was a golfist. What is she to do now, when she returns cityward? Adopt the long street skirt again, with its ragged, dirty edge, and weary her arms in her fruitless attempt to hold it above street filth? What is the use of women's clubs if they have no strength when establishing hygienic measures for our sex is concerned?

The question of dress for club women has been very strongly discussed of late in regard to elaborateness of dress while attending club functions. Should or should not the woman of means wear her elegant gowns in the presence of those who from economy's pressing needs must dress plainly. That, in brief, is the question shorn of all apologies and of all attempts to make an ugly fact appear a graceful one.

The question has been met too radically in the positive or affirmative, and by those who give a personal view only, forgetting that there are a great number of points to be considered, all of them equally sensible, and that to meet a question of such import one must put herself in the place of a score of others and give an impartial opinion.

Club life levels all financial grades. There the woman of means finds herself of no more importance than the woman of economy, providing their mental status is on an equality. It would be a foolish waste of time to discuss the frivolous woman of wealth, or her whose wealth is too new for it to have become a part of her. Instead, we will consider the woman of refinement and culture who is blessed with affluence and who displays no air of superiority over her less favored neighbor. The true woman of economy also experiences no feeling of inferiority because of her plain attire. Her paper carries just as much weight in club life as her wealthy neighbor's, providing it is equally well prepared.

The wealthy woman is accustomed to elegance and would not appear natural in inferior clothing. Her dress is a part of her. Let no one dispute her freedom in taste. When unfavorable criticism is made on her taste and personal appearance, she is probable to retire from the club. No one, however sensitive on the question of economy can desire this.

The woman who spends her money for expensive fabrics, and employs dressmakers and other trades people, is aiding greatly all enterprises. Sometimes she furnishes clerkships for the husbands of the very women who are one sided enough to criticize her elaborateness of dress.

The point first mentioned in regard to club women and dress, should concern us all. We have enough in that one topic, "hygienic

and artistic arrangement of dress" to occupy us in club discussion all the season, and we had best let the wealthy woman alone. Until late years, we may as well say until today, every thing in women's dress has been decided by fashion. Now, clubs will set the pace and fashion (whoever she has been) will be under club rule. The one great question, street skirt, should be rationally considered and decided. The long skirt gathers up disease germs.conveys them into the house and distributes them on carpet and upholstery. The wearer herself is liable to dislodge the germs from dress edge, while passing it over her head in dressing, and to swallow them. Children at play on the floor are sure to suffer results sooner or later. Even if not yielding to disease, the absorption of germs renders the system less resistant to illness generally.

After some of the family have been laid low from diphtheria, scarlet fever or other germinal disease, mourning robes are adopted and a wail goes forth against the "Hand of Providence." Poor Providence! that he couldn't have endowed women with sufficient intelligence to enable them to dress in cleanly manner. One woman, living in a suburb of New York, having searched in vain the location in which she lives for any trace of scarlet fever whereby her child took the contagion, finally concluded "I must have brought it from New York on the bottom of my dress;" and the period of her visit there made it a very probable conclusion, as no other cases had occurred nor did subsequently occur in the vicinity.

Physical strength should be utilized to better account than by holding up cumbersome clothing. And what about the grotesque picture presented by the average woman when thus engaged? She knows her neighbor is a "sight," but she evidently fancies herself a pleasing picture. Would she could "see herself as others see her." Generally she raises the skirt so high in places as to display lower limbs, or draws the skirt so snugly as to outline the body as plainly as though she had on tights, or grasps tightly the back midway below the waist as though holding a loosened garment from slipping off. The grotesque, not the artistic prevails and will as long as the trained street skirt is permitted.

In adjusting the short skirt, the wearer should stand on an elevation while the dressmaker decides the exact length, as the contour of instep and ankle rules the decision. The length should be from three to five inches from the floor, and often half an inch either way spoils the artistic effect. Great care should be taken that it hangs evenly. Above all, have shoes, jacket and hat up-to-date, and the shortened skirt will permanently establish itself for street wear.

Clubs claim to bring together the leading women of our country. Let these leading women lead in woman's real province, *health* and *attractiveness*, and let them annihilate the trailing street skirt that certainly is an exceedingly powerful enemy to both.

I ask all clubs who intend to discuss this very important topic, to kindly send me communications that I may publish them in this department. Our great work should be to make known our good works through CLUB LIFE, for the good of others.

A FAIR SPRINKLER.

By Grace Goodman.

If it is true as my cynical old bachelor friend Winthrop says, that all women look sallow in the morning, it is equally certain that they are beautiful in the twilight, especially in summer when seen on a lawn in white dresses. And I have come to the conclusion that my young neighbor across the way, who every night about eight makes her appearance on the lawn with a hose is very lovely, though this fact I cannot prove. What I can say is that she is graceful and slender, that she drags that slimy old hose across the grass in a really dignified manner, and that she has a fashion of holding back her skirts with one hand while she wields the hose with the other, which is truly picturesque.

Now I don't pretend to be anything of a student of human nature, but I really think that I can analyze this girl's character from the way she handles a hose. That she handles it at all is a proof of enterprise and individuality, for here in aristocratic Kenwood we usually hire some one to do our sprinkling for us and it is only because I enjoy the opportunity for a little outing that I am so conscientious about keeping my lady mother's grass well watered this season, and the one I have just hinted at, the fact that I am thus given the chance to study my unknown fair one. And as I was saying I have learned to know that girl from her manner of sprinkling.

In the first place she lacks application and method, one can see that from the way she will suddenly desert the roots of trees into which she has been boring and turn her spray to the topmost branches of another on the other side of the lawn. A man, myself for instance, will methodically go to work at one end of the garden and slowly and systematically cover every inch of space, never going back and never swamping one flower bed and neglecting another. Yet she is conscientious and always comes back to the deserted tree and tries to make up for her fickleness. Another is a certain pretty playfulness about her too, for she likes occasionally to point the stream in a direct line over her head and allow the drops to fall straight upon that mass of chestnut hair—at least I think it is chestnut. And once I fancied I discovered some consciousness of my presence in an apparent effort to imitate my more thorough going masculine method of watering carefully but one spot at a time. But it is simply impossible for her to keep steadily to one purpose and off she goes to the lilac bush that is already in danger of being uprooted.

And how fond she is of flowers. I often see her stoop to pat a lily on its head and sometimes I fancy I can hear her talking to the larkspurs and phlox which grow by the gate. It has come to be the chief

delight of my life to sprinkle our lawn of an evening, and only last night I heard mother remarking to a neighbor that it was wonderful to see how much interest I took in keeping the grass well watered. And the other day when one of the boys in the store asked me to go to a vaudeville performance with him I declined, saying that I had to water the lawn. He muttered something about water on the brain, but if he had said water on the heart he would have come nearer to the truth.

It may be months before we meet, it may indeed be after the water is frozen and the lilacs and larkspurs have gone into winter retirement, but somehow I feel deep in my heart a conviction that some day I shall be standing before my fair unknown, pleading for the privilege of doing her sprinkling for life.

SWEET MEMORIES.

By Elizabeth M. Griswold.

The memories which I love to store in mind
And oftenest recall, are not the kind
Which make a person wise,
I care not for the dates of peace or war,
For facts and figures gleaned from near and far
In which much knowledge lies.

I love to think of Nature at her best
When gold and purple paint the glowing West,
And gild each peak and spire.
Or when the splendors of her Autumn shine
On every burning bush, while tree and vine
Are pillars bright of fire.

Sweet, too, the memory of her gentle moods,
The flower and leaf unfolding in her woods,
The sweet breath of her spring,
Of glad hours when I rest beneath her shade
And listen, while from every copse and glade
Her hidden choirs sing.

Let those who will hoard up their learned lore,
Their secrets gleaned from wisdom's garnered store
And kept by them alone.
I'll hold in mind where first the violet peeps,
Where, rocked in gentle waves, the lily sleeps,
Their secrets are my own.

LIFE'S TRIO.

By H. S. Baker.

Oh Dream of Life! whose vapory ambitions
  And floating, fleeting fortunes fill all space;
Whose things of beauty make a moment happy;
  Whose fashions, finished fancies interlace;
Whose brightest lights like rocket stars shall vanish
  And make calm eve to seem a darkness felt,
Be part of life, sweet Dream, till earth shall perish
  And home be Heaven, where love has always dwelt.

Oh War of Life! whose ceaseless strife and clamor
  And blood and tears make living seem a pain;
Whose iron heroes have no rest till dying;
  Where wealth is law and wisdom cries in vain;
Where air is smoke, and love a greedy passion
  And roses, paint and music, soulless din;
Do not invade, Oh War of Life, the province
  My heart and I have taken shelter in.

Oh End of Life! so real and yet mysterious;
  Whose cold and darkness awe the truly brave,
Which gives reprieve to none for gold or honor,
  And makes the proudest seek the lowly grave;
Which gives my place and yours to those who follow,
  And brings to dust the earth built works of man.
Hope calls thee but "The usher of the future,"
  "The end of vanity," life's first short span.

A PURPOSE.

A purpose strong and high and true,
Towards which the daily work we do
Must aim, and ever strive to meet.
'Tis this alone develop will
And energy to work until
Our souls in striving grow complete.

TO ONOWA.

By Will Skaling.

Oh! the world is full of beauty and the east is flushed with light,
And the stars that glitter brightly, are fading from my sight.
Oh! the morn is full of music and the morn birds matin hymn,
So undeth sweet and ever clearer as the light robed seraphim.

THE DIVERSIFIED FARM.

In diversified farming by irrigation lies the salvation of agriculture.

INFORMATION FOR THE FARMER.

Last year over $1,200,000 worth of red clover seed was exported from the United States, principally to Europe; the year before over $1.800,000. In previous years still larger exportations have been made. But now Europeans, and especially the German scientists, are making great outcry against the American seed and against the plant resulting from American seed. This calls attention to the great difference between the American red clover and the European plant. An experimental plot of the Department of Agriculture shows the two plants (both Trifolium pratense) to be as widely dissimilar as two different species. The German red clover has almost hairless stems, while those of the American variety are covered with hairs, and the leaf growth of the German clover is much closer and heavier than our clover, which runs much more to stem. The German variety, however, does not stand hot weather.

"The clover belt of Europe," said Mr. A. J. Pieters, who is making a study of the different clovers, corresponds in climate somewhat to Minnesota, Wisconsin and sections of the United States much cooler than that of Mason and Dixon's line; and our plots clearly showed during the recent hot spell in Washington that German clover is not adapted to this part of the United States. Its leaves became brown and dry, although it was in moist soil, whereas the American clover beside it stood green and vigorous. I think, however, German clover may be a very valuable forage plant in our cooler sections, as its leaf growth is very thick and compact."

Some pure German seed will be procured and trials made of it in the more northern and northwestern states.

These experiments with German clover are of interest, too, from another standpoint than that of forage. Germany and central Europe generally, cannot raise nearly enough clover seed to supply the home demand and must always import large quantities. If they object to the American clover seed as producing a stalky, hairy plant not adapted to their wants, it is important to see if we cannot raise German clover seed to perfection and so keep up our large exportation of this farm product.

It is safe to say that few of the farmers who are sowing crimson clover know just what kind of seed they are planting or how liable they are to have poor seed sold them. Crimson clover seed which has been kept over for a year is very little good. It will hardly germinate at all. The agricultural department is receiving samples of seed which came originally from the various American seedsmen, and in almost every instance the fresh seed is more or less adulturated with the seed of the previous year's crop.

"Many of these samples," said Mr. A. J. Pieters in charge of the Pure Seed Bureau, "will not germinate fifty per cent; some will not germinate fifteen. It is easy to tell old seed or seed which has been spoiled in the curing by its dark brown color. Good fresh seed is quite light or amber colored.

"It would be such an easy matter, too," he continued, "for each farmer to test a pinch of his clover seed on a damp cloth and observe what proportion sprouts. It

layer of smoke between the plants and the sky, and so prevent the loss of heat. For this purpose smudge fires giving much smoke are best. Special torches made of muck and clay have been patented for this purpose. Those who have experimented in frost protection seem to think that the sprinkling method is the most practical and efficient.—*Ex.*

GOOD AND BAD-FITTING COLLARS.

Every horseman knows well the value of a perfect-fitting collar to the horse's neck and shoulders, says Dr. J. C. Curryer, in *Farm, Stock and Home*, and every horseman also knows the annoyance, irritation and torture to the horse, to say nothing about spoiling an otherwise good disposition, or making a balky horse of the naturally true puller, by a collar that is too long, too wide, and not adapted to the form of the shoulder. The harness horse does his work "from the shoulder," and certainly everybody will concede that for the comfort of the animal, and value to its owner, it deserves a perfect-fitting collar, and that nothing short of adaptation of the collar to the shoulder and neck will be satisfactory to either horse or driver.

Every horseman knows that not one collar in one hundred in daily use is a perfect fit; many will do, but a large majority of them are too wide for the neck and not adapted to the shoulders. Every horse should have his own collar to be able to do his work with comfort, and every collar should be fitted to the horse that is expected to wear it. If the collar is too long it should be cut off at the top; but if too wide and not adapted to the shoulders of the horse, don't think you must get a pad to fill in the space. Pads to the horse's shoulders in summer are about what overshoes would be to our feet—makes them tender and soft instead of firm and tough.

Select the style and length of collar best adapted to the work to be performed, and whether a new or old collar, soak it in water over night before fitting to the horse. When ready to put it on, wipe off the surplus water from the collar, put it on and adjust the hames at top and bottom, so as to bring the collar to the neck snugly its entire width. Don't have it wide at the top and close at the bottom, nor vice versa; but a close fit to the sides of the neck, so that the collar will sit firmly and not slide from side to side over the shoulders, but as nearly immovable as possible sidewise. When the collar is soaked thoroughly it can be brought to the sides of the horse's neck perfectly; but when the collar is dry and stiff this cannot be done with any degree of satisfaction. When the wet collar has been fitted to the horse's neck, with the hame-tugs draught at the proper place (neither too high nor too low), then work the horse in this wet collar at moderate draught until the collar is dry, and a perfect fit can be obtained. There is no other way in which it can be done perfectly, and we should never be satisfied with anything short of an absolute fit of the collar to both sides of the neck and the form of the shoulders.

Every manufacturer of leather to a form invariably works it while soaking wet and then leaves it to dry, after which it will maintain its form until soaked again and changed. Don't be afraid of injury to the collar by soaking, if it is to be put on the horse and brought to position and maintained in proper place until dry again. When the horses are worked down thin in flesh and the collars are too wide it is a simple matter to soak them again and fit as in the first place. Keep the horse's shoulders sound by perfect fitting collars (which costs nothing), and they will do their work more easily and cheerfully, and you can sleep sounder.—*California Cultivator.*

BARS BEET-SUGAR BOUNTY.

The state supreme court in a unanimous opinion handed down today declared the act granting a bounty of 1 cent per

pound on all beet-sugar manufactured in the state unconstitutional. The act was passed by the legislature of 1897. The decision is the result of a mandamus asked for by the Michigan Sugar Company of Bay City to compel the auditor general to pay the bounty earned in 1898.

HOW TO KEEP MILK SWEET.

How to keep milk sweet without preservation is a question that confronts every dairyman. The question is only half answered by some of our best dairymen, and not answered at all by others. There is probably no better food for the growth of bacteria than milk, and once in it they will develop with astonishing rapidity. In the udder of the average cow there is no bacteria, and to get this milk into closed cans without exposing it to a great number of bacteria is the heart of the problem. From the time the milk leaves the udder till it gets into the closed can, it must run through the midst of the bacteria that should not be incorporated with it. At the exit from the teat it encounters thousands of these minute plants, unless they have been washed out. Other bacteria drop from the outside of the udder has been washed. From the hands of the milker fall several kinds of bacteria, unless the hands have been washed. Finally in the bottom and seams of the pail are found still other bacteria, unless the pail has been made more than usually clean. By close attention to all of these details, the milk can be made to pass through air that is comparatively free from fermentive bacteria.—*Western Creamery.*

THE DELICATE CALF.

The stomach of a calf is delicate and sensitive, and any change of feed should be made gradually. Do not change from whole milk to skim milk faster than a pound a day, allowing from ten days to two weeks for the change. Before turning on pasture it is better to feed a little green feed and gradually increase the amount until the limit of the calf is reached. Otherwise the calf may suffer severely from scours by the sudden change to pasture.

Don't over feed. Calves are greedy at feeding time and there is often a great temptation to give more milk than the calf can properly handle, thus causing them to scour. Over-feeding is undoubtedly the main reason why so many farmers are not able to raise thrifty calves on skim milk.

Never put corn, kafir corn meal or any other grain in the milk for calves. The starch in the corn has to be changed to grape sugar before it is digestible. This change only takes place in the presence of alkali, and is done chiefly by the saliva of the mouth. When corn is gulped down with the milk, the starch is not acted on by the acids of the stomach, but remains unchanged until it comes in contact with the alkaline secretions of the intestines. With hogs the stomach is small and the intestines long. This allows starchy matter to be digested in the intestines short. Unless the starchy matter is largely digested by the saliva of the mouth, complete digestion will not take place in the intestines and the calf scours.—*Exchange.*

POULTRY NOTES.

Many of those who raise poultry and endeavor to give the best of care, make a practice of feeding their fowls at noon. Nothing is so injurious or does more harm than the giving of three meals a day. It is simply a forced fattening process that sooner or later brings in its train every ill that can befall the flock. Because three meals a day gives good results at first it will be adhered to as a practice and when disease appears or the hens cease to lay the cause becomes a mystery, the three meals never being suspected.

It used to be the habit of farmers, says the *American Cultivator*, to kill the largest turkeys for market, and save for

layer of smoke between the plants and the sky, and so prevents the loss of heat. For this purpose smudge fires giving much smoke are best. Special smudges made of muck and clay have been prepared for this purpose. Those who have experimented in frost prevention seem to think that the sprinkling method is the most practical and efficient.—Ed.

GOOD AND BAD-FITTING COLLARS.

Every horseman knows well the value of a perfect-fitting collar to the horse's neck and shoulders, says Dr. A. C. Cumpton in *Farm, Stock and Home*, and every horseman also knows the annoyance, irritation and misery to the horse, to say nothing about spoiling an otherwise good disposition, in making a balky horse of the naturally true puller, by a collar that is too long, too wide, and too shapen to the form of the shoulder. The harness horse does his work "from the shoulder," and certainly everybody will concede that for the comfort of the animal, and value to its owner it deserves a perfect-fitting collar, and that nothing short of adaptation of the collar to the shoulder and neck will be satisfactory to either horse or driver.

Every horseman knows that no one collar in one hundred in daily use is a perfect fit, many will do, but a large majority of them are too wide for the neck and not adapted to the shoulders. Every horse should have his own collar to be able to do his work with comfort, and every collar should be fitted to the horse that is expected to wear it. If the collar is too long it should be cut off at the top, but if too wide and not adapted to the shoulders of the horse, don't think you must get a pad to fill in the space. Pads to the horse's shoulders in summer are about what roseboxes would be to our feet—makes them tender and soft instead of firm and tough.

Select the style and length of collar best adapted to the work to be performed, and whether a new or old collar, soak it in water two nights before fitting it to the horse. When ready to put it on, wipe off the surplus water from the collar, put it on and adjust the hames as tight and broad, so as to bring the collar to the neck snugly as under work. Put a hame strap to the top and close at the bottom, and vice versa, but a close fit to the sides of the neck, so that the collar will sit firmly and no slide from side to side over the shoulders, but as nearly immovable as possible sidewise. When the collar is soaked thoroughly it can be brought to the sides of the horse's neck perfectly, but when the collar is dry and stiff this cannot be done with any degree of satisfaction. When the wet collar has been fitted to the horse's neck, with the hames straps drawn in the proper place (neither too high nor too low), then work the horse in this wet collar at moderate draught until the collar is dry, and a perfect fit can be obtained. There is no other way in which it can be done perfectly, and we should never be satisfied with anything short of an absolute fit of the collar to both sides of the neck and the form of the shoulders.

Every manufacturer of leather or a firm invariably works in while soaking wet and then leaves it to dry, after which it will maintain its form until soaked again and changed. Don't be afraid of injury to the collar by soaking, if it is to be put on the horse and brought to position and maintained in proper place until dry again. When the horses are worked down thin in flesh and the collars are too wide it is a simple matter to soak them again and fit as in the first place. Keep the horse's shoulders sound by perfect fitting collars (which costs nothing), and they will do their work more easily and cheerfully, and you can sleep soundly.—*California Cultivator*.

BARS BEET-SUGAR BOUNTY.

The state supreme court in a unanimous opinion handed down today declared the act granting a bounty of 1 cent per

pound on all beet-sugar manufactured in the state unconstitutional. The act was passed by the legislature of 1897. The decision is the result of a mandamus asked for by the Michigan Sugar Company of Bay City to compel the auditor general to pay the bounty earned in 1898.

HOW TO KEEP MILK SWEET.

How to keep milk sweet without preservation is a question that confronts every dairyman. The question is only half answered by some of our best dairymen, and not answered at all by others. There is probably no better food for the growth of bacteria than milk, and once in it they will develop with astonishing rapidity. In the udder of the average cow there is no bacteria, and to get this milk into closed cans without exposing it to a great number of bacteria is the heart of the problem. From the time the milk leaves the udder till it gets into the closed can, it must run through the midst of the bacteria that should not be incorporated with it. At the exit from the teat it encounters thousands of these minute plants, unless they have been washed out. Other bacteria drop from the outside of the udder has been washed. From the hands of the milker fall several kinds of bacteria, unless the hands have been washed. Finally in the bottom and seams of the pail are found still other bacteria, unless the pail has been made more than usually clean. By close attention to all of these details, the milk can be made to pass through air that is comparatively free from fermentive bacteria.—*Western Creamery.*

THE DELICATE CALF.

The stomach of a calf is delicate and sensitive, and any change of feed should be made gradually. Do not change from whole milk to skim milk faster than a pound a day, allowing from ten days to two weeks for the change. Before turning on pasture it is better to feed a little green feed and gradually increase the amount until the limit of the calf is reached. Otherwise the calf may suffer severely from scours by the sudden change to pasture.

Don't over feed. Calves are greedy at feeding time and there is often a great temptation to give more milk than the calf can properly handle, thus causing them to scour. Over-feeding is undoubtedly the main reason why so many farmers are not able to raise thrifty calves on skim milk.

Never put corn, kafir corn meal or any other grain in the milk for calves. The starch in the corn has to be changed to grape sugar before it is digestible. This change only takes place in the presence of alkali, and is done chiefly by the saliva of the mouth. When corn is gulped down with the milk, the starch is not acted on by the acids of the stomach, but remains unchanged until it comes in contact with the alkaline secretions of the intestines. With hogs the stomach is small and the intestines long. This allows starchy matter to be digested in the intestines short. Unless the starchy matter is largely digested by the saliva of the mouth, complete digestion will not take place in the intestines and the calf scours.—*Exchange.*

POULTRY NOTES.

Many of those who raise poultry and endeavor to give the best of care, make a practice of feeding their fowls at noon. Nothing is so injurious or does more harm than the giving of three meals a day. It is simply a forced fattening process that sooner or later brings in its train every ill that can befall the flock. Because three meals a day gives good results at first it will be adhered to as a practice and when disease appears or the hens cease to lay the cause becomes a mystery, the three meals never being suspected.

It used to be the habit of farmers, says the *American Cultivator*, to kill the largest turkeys for market, and save for

breeding some of the later broods that had not got their growth. The idea was that with good feed and care these will be as large by spring as those hatched early in the season, and which get nearly their full growth by the holidays. But this is rarely the case. The late turkey, small at Christmas, becomes stunted, and never attains the size it would if hatched earlier. Breeding from these immature and stunted turkeys runs out the breed. Some experienced turkey breeders keep their largest fowls for breeding and retain them until they are two years old. The chicks from these older turkeys are stronger and less liable to die off while young. The young of the turkey is a tender bird at the best. It will pay to breed only from birds that have attained good size and full maturity.

WHEAT GROWING.

The results of trials at the experiment station at Stillwater, Okla., and the practical experience of wheat growers all over the territory show that early ploughing and early sowing for wheat have given the highest yields and the best wheat. At the experiment station, wheat on ground ploughed on July 19, yielded a little more than twice as much as that ploughed on September 11, the seeding in both cases being done on September 15. The explanation of this is that the early ploughed land is in condition to absorb and retain the moisture while that which has just been ploughed is not in good condition for the germination of the seed.

Wheat seeded September 15 yielded 37; October 15, 35; and November 15, 23 bushels per acre. The early seeding was much less affected by rust than the last seeding. These results agree with those of former years. Seeding should be completed before the middle of October and better resulfs will be obtained from seeding from the middle to the last of September.

As to varieties, the hard wheat as a rule are preferred in the western half of the territory and the soft wheat in the eastern. At the station, the highest yield, 44.52 bushels per acre, was obtained from Sibley's New Golden; the lowest 37.70 from Big English. German Emyeror, Turkey, Pickaway, Red Russian, Early Ripe, Fulcaster, New Red Wonder, Fultz, Missouri Blue Stem. and Early Red Clawson all gave satisfactory yields. All of these varieties aae medium earlw, with but a few days difference in heading and ripening. The seed is all kept up to high standard by careful selection and grading each year. If more fanning mills were used in the preparation of seed wheat, there would be less complaint of varieties "running out" and less of demand for new varieties.

Smooth meadows make the labor of mowing easy. If yours are all rough or stony, it will pay to go over them this fall with a heavy roller, having on it a box in which to put the stones; pick up every one. This will save broken knives on your mower next summer.

Many a farmer would find it profitable to smooth the roadside and seed it to grass, and then use it for pasturing his own stock or cut it for hay. The road will be thus kept much neater and at less expense than by permitting it to remain rough and to grow up in weeds.

PULSE OF THE IRRIGATION INDUSTRY.

NEW METHOD OF IRRIGATION.

Next season an entirely new system of irrigating orchards will be introduced in the vicinity of Ontario, Ore. It will be applied to the land that is above the canals. Water will be hauled in wagons to where it is wanted. At the root of each tree will be placed a 10-gallon water box. This box is to be filled once every two weeks during the dry season until the tree is five years old. To fill these boxes, on the basis of 20 acres of orchard, it will require 30,000 gallons of water. This will take a team and one man six days. The soil will be cultivated thoroughly and about three times as deep as is usual. It is claimed by advocates of the new system that fruit raised with a dry surface will be far superior to that raised with surface watering. The spider and moth will not be attracted by damp soil. The usual water rental is $1 per acre for surface watering. It is claimed under the new system two inches of water will irrigate 20 acres of bearing orchard. It is proposed to grow melons in the same way, the water box at the melon root, of course, being smaller. It is claimed that melons in this country are not of the best quality on account of lying on moist ground and becoming the prey for the different kinds of insects. Under the new system, the melon rests on a dry surface, colors naturally, ripens evenly, is not filled with water by evaporation, has an even and regular rind, ships better and keeps better in the market.

GETS A BIG CONCESSION.

The government federation of Mexico has granted a valuable concession to A. J. Streeter of New Windsor, Ill., for the famous Fuerte river valley, in the State of Sinaloa. Fuerte valley has an area of 200-000 acres, and Mr. Streeter owns 65,000 acres near Topolobampo bay, on the line of the proposed Kansas City, Mexico & Orient railroad. The concession grants the holder the right to use one-half of the water from the Fuerte river. If the scheme is consummated it will prove of great benefit to the state. Survey plans and a location of a canal will be made next winter.

BIG IRRIGATION ENTERPRISE.

State Engineer Ross, of Idaho, has returned from a trip to Ogden, and he states that final arrangements have now been made between the state and the American Falls Power & Canal Company for the opening of the company's canal. The state filed on 57,000 acres of land in Bingham and Bannock counties under the Carey act about a year ago, and the land is all under the proposed canal.

The state insisted that the settler be allowed the right to buy shares of stock in the company rather than be assessed each year, and the company has given way.

The work of construction will be undertaken by the Utah Construction Company, and the enterprise will cost $325,000, the company giving a bond of $150,000 to complete the work within 18 months. The canal will cover 75,000 acres of land now arid. The ditch will be 65 miles long, 70 feet wide at the bottom, and will carry 65,000 inches of water.

WATER STORAGE BENEFITS.

The western half of the United States to-day supports a population ranging somewhere around 5,000,000. Much of this population has been attracted by the cry of gold, and the capital invested in western mines today is enormous. Yet it is not a tithe of the amount which the value of the

mineral-laden ore of the West warrants; only these minerals are locked largely in the grasp of the arid belt. Water is what is needed. Hills and mountains of extreme richness lie undeveloped and desolate, surrounded by barren deserts or sagebrush plains. Capitol is slow to venture into such places, even with the great mineral wealth in sight. Gold is not the only metal, tons of which are locked in the rocky bosoms of the Western Sierras, but all the family of baser metals are richly represented, and the question of transportation enters largely into their mining. Railroads will not follow mining camps alone; but reclaim the arid lands of the West, give to them a settled agricultural population, and railroads will quickly pierce the desert. And here, too will be a source whence to feed the men and the mules that work the mines; feed them at reasonable rates. Many a torrent of great volume rushes down the slopes during the period of melting snows and spreads away in a glistening stream across the brown plain, but before a crop can be raised its volume has waned and its bed becomes dry sand. Yet store this water in a mountain reservoir and it would afford a perennial supply, capable of irrigating land whose fertility has never felt the washing, weakening power of rain. Then, along with the agricultural development would come mining development.

There are many regions where irrigation has transformed the agricultural lands and railroads have been quickly built, where adjacent mines—the necessities for man and beast and transportation at hand—have been simultaneously developed, adding vast sums to our mineral output which otherwise might have lain dormant.

IRRIGATION IN HAWAII.

Interesting irrigation development is reported from the island of Hawaii, in the discovery of underground currents. Immense subterraneum streams of the purest water have been uncovered from 1,500 to 2,000 feet above the sea level. The water will be flumed down to the sugar plantations at lower elevations, affording an abundance for irrigation.

From five subterranean streams, tapped within the past few weeks, the Olaa plantation has secured a continuous flow of 20,000,000 gallons every twenty-four hours, more than enough to irrigate the plantation, which is the largest in the island. The water has drained from the surface into the subterranean beds of ancient lava.

In the Hawaiian cane-fields under irrigation the average yield is reported as five and three-quarters tons of sugar per acre, and reaches in some cases as high as ten tons per acre. The Louisiana sugar yield is on an average only 2,800 pounds, or a little over one and a half tons.

EASTERN INTEREST.

That the Eastern manufacturer is awakening to the possibilities of an irrigated West as a market for his products is shown to some extent in the remarks of Mr. Tom L. Cannon, the representative of an Eastern manufacturing association at the recent Trans-Mississippi congress. Mr. Gannon said in part: "If the water that goes to waste in the mountains of the arid regions were stored and controlled, it would save to the federal government by preventing floods in the overflowed lands along the Mississippi river, more than the cost of construction and operation of reservoirs. If arid America were made humid, the crops produced would give the federal government revenue in the way of increased taxation; millions of people would be employed; millions of homes would be established, and the richest country ever known to the world would be developed.

"If steps were taken for the construction of storage reservoirs by the federal government for the reclaimation of arid America, the next fifty years would show a ratio of increase in population far greater in this section than during the past fifty years.

"I believe it to be the duty of every man who is interested in populating the western half of this hemisphere as densely as the eastern half is populated, to aid in the reclaimation of arid America through irrigation by means of federal storage reservoirs, which will serve the double purpose of irrigation supplies and flood protectors."

WITH OUR EXCHANGES.

LADIES HOME JOURNAL.

A score of writers and artists contribute to the October *Ladies' Home Journal*, and the issue is one of commanding excellence. The number opens with "The Story of a Young Man," which portraying Jesus as a man, and viewing him in the light of his humanity, fills a unique and unoccupied place in current literature. The first of "A Story of Beautiful Women" tells of the romance of an American girl who married a Boneparte, and a series of stirring adventures are narrated in the first of the "Blue River Bear Stories," by the author of "When Knighthood was in Flower." Mrs. Elizabeth Stuart Phelps' new novel, "The Successors of Mary the First," which has to do with domestic and suburban life, and is exceedingly funny, is begun in the October Journal. Edward Bok arraigns the Pullman Palace Car Company for teaching false standards of decorative art. Of the special features of interest are: "The Longings of a Secluded Girl," "A Minister Among the Cowboys," "Romances of Some Southern Homes," "How We Can Lead a Simple Life," and "Criticising the Clothes of the Minister's Family," "A Georgian House for $700" and "A Farmhouse for $3500" are given, with building plans and details, and "A Successful Country Home" pictures the exterior and interior of a house of log construction. By The Curtis Publishing Co., Philadelphia. One dollar a year; ten cents a copy.

MC CLURE'S.

Especial interest will attach to a special article in the campaign number of *McClure's Magazine*, entitled "The Strategy of National Campaigns." Dr. A. Conan Doyle will write on "Some Lessons of the War," in which he takes up the various branches of the service in the South African war and criticizes their conduct in the late struggle as well as the general system governing the British army. "The Horse Thief" is the title of a story by E. Hough. It tells how four Western ranchmen, as they innocently would have put it, attempted to "run off a bunch" of several hundred horses "up in Montanny."

THE FORUM.

Of the fourteen articles which constitute the October offering of *The Forum* no less than eleven may be classed under the head of timely. In a ringing article Senator J. P. Dolliver discusses what are "The Paramount Issues of the Campaign" from a Republican point of view. Two views of the Cuban question are given, one being "A Plea for the Annexation of Cuba," by a Cuban whose name cannot be disclosed, and the other a forcible exposition of the reasons "Why Cuba Should be Independent." The Hon. Charles Denby considers "The Future of China and of the Missionaries" in a tone that will find thousands of sympathizers even among those who decide such questions by the test of political expediency. "The Negro Problem in the South" is taken up by Representative O. W. Underwood, of Alabama, in an article that may be considered a reply to Gen. C. H. Grosvenor's late plea against the disfranchisement of the ignorant negro voter. In an article full of information Marion Wilcox analyzes the substance of "Our Agreement with the Sultan of Sulu," and Victor S. Clark, late President of the Insular Board of Education in Puerto Rico, tells of the strides education is making under American auspices on that island. "The British General Election" is treated by no less an

authority than Henry W. Lucy, the well-known "Toby, M. P.," of London *Punch*.

SCRIBNER'S.

John R. Spears' papers, "The Slave trade in America," are concluded in the October number, with an account of the final suppression of the horrible traffic. Walter Appleton Clark continues his remarkable illustrations to the series. The fiction of the number includes a story of a convict settlement, by Lloyd Osbourne, the stepson of Stevenson; a New England story by Arthur Colton, and the last installment but one of "Tommy and Grizel."

A BIT OF PHILOSOPHY.

What's the use o' lyin', cryin', sighin'?
What's the use o' fussin', mussin', cussin'?
Does the savages' complainin'
Stop the rattle o' the rainin'?
Does the tormentin' and teasin'
Make the winter quit a freezin'?
    Quit a blowin'?
    Quit a snowin'?
Does the grumblin' and the groanin'
Do a bit toward atonin'
For the miserable moanin'
    Through the trees?
Does the scowlin' and the growlin
Stop the prowlin' and the howlin'
    O' the breeze?
Won't the sunlight be the brighter
If we keep our faces lighter?
Don't the dreary days seem longer,
And the wailin' wind seem stronger,
    If one frets?
Make the best of all the weather,
Sing an' smile an' hope together,
    Won't you? Let's!

—*Medical Times.*

MRS. WM. McKINLEY.

THE IRRIGATION AGE.

VOL. XV. CHICAGO, NOVEMBER, 1900. NO. 2

THE PROGRESS OF WESTERN AMERICA.

National Irrigation Congress.

The National Irrigation Congress will hold its ninth annual session at Central Music Hall, Chicago, on the 21-24 November, 1900. Reduced railroad rates have been arranged for. It will be a business mens' convention. Chicago wholesale merchants are taking a genuine interest in the proposition to reclaim the West, and thereby increase its population fifty million, and the work of the Congress will be directed toward placing before the business interests of the West the trade possibilities which lie in the reclamation of some seventy-five million acres of arid land, whose fertility has lain dormant for hnndreds of centuries, waiting only the touch of water to make it as productive as the valley of the Nile.

A Remarkable Month.

The October just past was a record breaker so far as weather was concerned, it having been the warmest October ever experienced during the existence of the weather bureau. This unusual weather was detrimental to some lines of trade—the dry goods and clothing business having suffered the most owing to their inability to dispose of the customary fall goods. For the farm work the month was favorable, being mild east of the Rocky Mountains, with ample moisture in most districts. The following resume of the crop conditions for the month of October was recently given by the *Daily Trade Record:*

Portions of the lake region, Ohio Valley, and middle Atlantic states, however, needed more rains, while heavy rains, principally during the latter part of the month, caused some damage in the central gulf states and in the upper Mississippi and Missouri Valleys. On the north Pacific Coast the month was generally favorable, although frequent rains in the latter part of the month retarded work in Oregon.

In portions of the upper Missouri and Mississippi valleys the mild, moist weather has proved unfavorable to corn, causing considerable mold and some rotting in localities.

With the exception of some damage by fly in portions of Missouri, Illinois, Michigan and Ohio, the reports respecting fall wheat indicate that the crop is in promising condition. The weather conditions have been favorable for germination and vigorous growth.

Cotton picking was interrupted by rains in portions of Arkansas, Louisiana and Mississippi, and in the last named state the staple suffered some damage. While picking is practically completed over the eastern portion of the cotton belt considerable cotton remains to be gathered over the northern portion of the western districts. Under the mild temperature conditions the top crop made considerable growth, especially over the eastern districts, but owing to the advanced season it is not expected to mature.

Rich Uncle Sam.

It is claimed that never before in its history has this government had so much gold bullion and coin at its disposal as at present lies in the treasury. In this connection an exchange gives the following figures:

"The gold bullion and coin to the credit of Uncle Sam amounts to $451,477,404, and added to this are gold certificates, which will be redeemed in gold, to the amount of $35,658,180, making a total of $487,135,584. This fund is divided into reserve, trust and general funds. The reserve fund amounts to $150,000,000; the trust fund, $248,409,679: and the general fund, $53,067,725 in coin and $35,658,180 n certificates, making a total of $88,725,905 in the latter fund. There in enough gold in the treasury to give $6 in the yellow metal to every man, woman and child in the United States, on the basis of 75,000,000 population. Even then there would still remain in the treasury the $35,658,180 in notes, which can be redeemed only in gold. To give an idea of how great an amount of gold is stored in the treasury, it is only necessary to point out that the entire stock of gold in Great Britain is but $462,300,000, or $24,835,584 less than is actually in the United States at this moment when the gold notes are included in the total.

The silver figures are still more astonishing. There is in the trust fund $425,120,000 in silver dollars: $3,73,053 in silver dollars of 1890: $62,258,947 in silver bullion in the reserve fund. Adding the figures representing the gold and silver coin and bullion in the several funds we find that the total amounts to $890,310,679.

There is enough scattering wealth in the treasury, including silver certificates, silver bullion, treasury notes and national bank notes to bring the grand total up to $1,003,685,779.

The Rush to City.

John Habberton, in the *Saturday Evening Post*, says that the new census statistics will be disappointing to the people who had hoped that the rush of villagers and country people to the city was checked. The old explanation of this continuous rush to the cities was that "farmers' sons and daughters wearied of work that was never finished: they had heard of city demands for labor and of city wages, payable always in cash and at stated dates. They had also heard of city pleasures, some of which were said to cost nothing, while others were very cheap. But young people do not constitute the whole body of people who are crowding into the cities, for mechanics and artisans of all kinds are in the throng, for in the villages and country districts employment is irregular and pay uncertain. The more aspiring of the hope for the larger opportunities and recognition that the country dares not promise: they know, too, that such of their children as incline to study may become fairly, even highly, educated in the city without special cost to their parents. Of the 'seamy' side of city life they know nothing, but their acquaintances 'went to town' have not returned to tell of it; few of them could return if they would. The few who go back to the old homesteads are the men who have succeeded, and in any village such a man in effect resembles a gold-laden miner from Cape Nome or the Klondike: his example threatens to depopulate the town."

Mr habberton takes an optimistic view of the subject and in conclusions says: "Nevertheless, the rural districts are not going to be depopulated, except when their soil is very poor and their malaria over-rich. A countryward movement started in some cities a few years ago, and it has been increasing in volume; it may be almost invisible in some localities, for three million square miles is an area so great that any city's overflow might be lost in it. The men who are trying scientific farming are all from the cities and they have carried their city ideas with them. As a rule, city brain and city money are suggesting and backing the rural attempts to have good roads, pure water, perfect drainage, high farming, high grade schools, free libraries and many other ameliorations of old-time conditions. Yet in one respect the city

man in the country is a disappointment to all classes of the dissatisfied, for when they talk of going to the city he persistently says 'Don't' and he supports his advice with a dismal array of facts and figures."

To Arouse Interest.

Redlands, Cal. expects a visit soon from William E. Smythe, erstwhile editor of the IRRIGATION AGE and a gentleman thoroughly conversant with the great problems of irrigation and the reclamation of arid America. His visit will be in the interest of the California Water and Forest Association and will be accompanied by P. F. Wood, of Tulare, P. N. Berniger, of San Francisco, and S. C. King, also of that city, or, if not these gentlemen, by others interested in the subject. The object of the visit is to awaken the interest of our people in the great work of association, and get them to be active in the changes necessary in our laws to enable irrigation to be extended and made more secure, and to assist in obtaining aid from the general government in building storage reservoirs to hold flood waters over for use in time of deficient rainfall. "Mr. Smythe should be heartily and cordially received" says the *Citrograph*, "and his talk listened to with close attention."

Eggs Galore.

The egg testers of Chicago have just organized themselves into a local labor union with the intention to effect a national organization. About 200 men find employment inspecting eggs in the big storage houses of South Water street and vicinity. The egg tester must daily handle thousands of eggs that can be guaranteed and sold to the trusting housewife under the "strictly fresh" stamps.

According to statements furnished by managers of cold storage houses the supply of eggs in Chicago at the beginning of this year in round numbers was 252.000,000, enough to give the entire population of the United States at least one square meal. Putting it in another form, this meant 700,000 cases of eggs, thirty dozen or 360 to the case, and it would be enough to fill every inch of space in the Masonic Temple. This was a supply unprecedented in the history of any city, and was largely due to the mildness of the then prevailing winter weather, when the simple-minded hen kept on laying, to the great consternation and financial loss of the storage speculators. It was about 60 per cent. of all the marketable eggs in the United States in January. All the storage eggs in this country during that month it was estimated aggregated 1,250,000 cases, or 450,000,000 eggs.

It is on record that the eggs received in this city in 1898 numbered 773,262,000; in 1899, 753,596,900. The number reshipped to other cities and towns in 1898 was 440,408,160: in 1899, 359,969,480. It takes about 50,000 to 60,000 cases of eggs, or 18,000, to 21,600,000 distinct and individual eggs to supply the local Easter market. The number of eggs received during Easter week, this year, exclusive of "through" shipment, was 20,250,000; over 50,000 cases. The receipts of eggs in New York last year were 2,642,252 cases, and this Eastern supply was drawn largely from the Western country by way of Chicago.

Speaking of the hen figuratively, as representing her entire tribe, she annually earns more than the total value of the wheat crop, more than the total value of the cotton crop, and is still clucking cheerily away as though she had done nothing remarkable after all. It is estimated that there are about 350,000,000 chickens in the United States, which produce each year something like 14,000,000,000 eggs. This number of eggs represents in money value about $175,000,000. The consumption of poultry as food amounts to $130,000,000 annually, and the total value of living hens at 30 cents apiece is $150,000,000. Thus the entire product of the humble hen may be said to be some $410,000,000 a year, while all the cows in the country foot up a total value of only $370,000.

The fact is that egg producing is carried on now not only far more extensively but far more systematically than ever before. The breeds of chickens everywhere have

been improved, though more in some parts of the country than in others. This improvement is everywhere expanding. There are many great chicken farms in the immediate vicinity of Chicago, where chicken-raisers confine themselves to special breeds, and this is true of other localities. The great egg season of the year is not winter, but spring. Commercial eggs may vary in price as much as five cents a dozen; handsome, large selected, high-grade eggs may be worth five cents a dozen more than ordinary eggs. These superior eggs may be the production of special breeds of stock, but the eggs of comparatively ordinary hens packed with care may bring a cent or two more a dozen than the same eggs packed as they run.

Experts are Banqeted.

The Commercial Club, of Chicago, had several experts on Irrigation, at a banquent Oct. 27, who discussed irrigation for the reclamation for the arid lands of the West.

The addresses were made by Professor Elwood Mead, irrigation expert of the Department of Agriculture; F. H. Newell, hydrographer of the United States Geological Survey; George H. Maxwell, executive chairman of the National Irrigation Association, add A. C. Bartlett of the Commercial club.

Mr Maxwell emphasized the relation of the subject to Chicago by his statements that modest estimates of what could be accomplished by the irrigation of lands now arid placed the population such regions could support at 50,000,000 persons, while with greater improvements than those considered these lands could be made capable of sustaining 200,000,000 persons.

"With such a country in the West Chicago would become the greatest city in the world," the speaker declared.

The interest of the club members in the proposed plans for reclamation of these arid lands was asked. The direct question for discussion was whether the federal government should make appropriations for the construction of water storage reservoirs and for the reclamation of land. It was answered in the affirmative by Mr. Maxwell when he said that Congress at its next session should make appropriations for the construction of such water storage basins.

Mr. Newell illustrated his address with stereoptican pictures of the arid land under consideration. He showed the contrast between the desert and the cultivated lands and explained the reasons why irrigation is necessary throughout one-third of the United States and is beneficial to at least two-thirds of the country. He illustrated the work the government now is carrying on to locate reservoir sites.

The necessity for public improvement rather than private improvement was indicated by the statements that nearly all the capital which had become interested in the reclamation of arid lands had suffered a loss. It was asserted that the work of reclamation by irrigation should be done by municipalities and States, and in cases in which the work overlapped into several States by the federal government.

In the event of construction of storage basins by the government it was held that the benefit should be received by the landholder, who went into the desert to build a home.

Professor Mead spoke of the conditions existing in the West and explained the character of the laws regulating water rights. These, he said, illustrated the necessity of federal supervision to bring them into unity.

Denver Business Men.

Colorado business men recognize the benefit that attaches to their state through the Government along the lines of irrigation investigations and surveys for reservoir sites. The Denver Chamber of Commerce and Board of Trade last month adopted rigorous resolutions calling attention to the great development possible in Colorado, through irrigation, and to the generally accepted opinion that only by the storage of flood waters can the future problem affecting successful farming in the arid region be solved, and pledging support to the United States Geological

Survey in securing large Congressional appropriations for carrying on their work for surveys of reservoir sites, and other preliminary irrigation work.

Waste of the Waters. Many sections of the West are beginning to reap the bitter fruits of forest destruction. A few years ago the snow would drift, and pile up in the mountain gulches, thickly studded with pine and other trees, forming an almost impenetrable forest protection, and there gradually melt away, supplying water for the streams until late in the season. This, now, has too often changed. The timber has gradually, but surely, been cut and burnt away, until now some of the finest forests of the mountains have disappeared, and where the snow banks would remain until late in the season, they now disappear months earlier, and instead of melting gradually, the flood-waters come with a rush, and then cease when most needed. There is scarcely anything more important than forest protection and preservation, which means a guarding of the water supply; and every state and every section should rouse to active local organization and national co-operation.

A Good Investment. Every dollar expended by the National Government for the building of reservoirs and great irrigation works to reclaim the millions of acres of western aridity will return to the Federal treasury six to one in the form of increased taxes on increased land values and population. Every congressman knows this, now that his attention is being called to the subject by eastern manufacturers who want a largeer market in the West for their goods, and all this is required for his favorable action is a strong and aggressive demand from every western State and Territory and Congr ⁂ sional district.

IRRIGATION FOR THE EAST.

The office of Experiment Stations of the U. S. Department of Agriculture will soon issue bulletin No. 87, entitled "Irrigation in New Jersey." It was prepared by Prof. E. B. Voorhees, of the New Jersey Experiment Station, and describes his experiments in irrigation for the season of 1899. It is generally thought that the necessity for irrigation in the United States exists only in the region west of the Mississippi River, but repeated crop failures in the East and successful farming in the West have called attention to the importance of controlling the moisture of soils rather than accepting the conditions as they exist. Professor Voorhees estimates the loss to the hay crop of New Jersey from the drouth in May and early June, 1899, at $1,500,000, while small fruits and vegetables were even more seriously affected than the grasses. The records kept by him at the experiment station show that in 1897 and 1898, years of abundant rainfall in April and May, the yield of hay averaged 2.65 tons per acre. In 1899 it was but a fraction over 1 ton, owing to the deficiency of rainfall in April and May, at the low price of $10 a ton, a loss for the 25 acres of over $400. The yield of crimson clover forage for 1897 and 1898 was 8.5 tons per acre; in 1899 the yield was but 5 tons, or in a good year the yield was 70 per cent greater. The deficiency in the rainfall at the critical period was alone responsible for this difference in yield. Oat and pea forage in 1897 and the early seeding of 1898 averaged 6 tons per acre; in 1899 the yield was but 3.3 tons per acre.

To show the frequency of such drouths as that of 1899, the bulletin cites the rainfall records of Philadelphia: "The rainfall records in Philadelphia from 1825 to 1895 (seventy years) show that in 88 per cent of the year there was a deficiency of over one inch for one month, or that in 62 years out of the 70 there was one month in the growing season from April to August in which such a marked deficiency occurred as to cause a serious shortage of crop, and that for the same period there were 39 years in which the deficiency extended throughout two months, while in 21 years it extended throughout three month, or in 30 per cent of the years included in this record there were three months during the growing period in which the average rainfall was deficient one inch or more. It was thus observed that a wide series of crops would be likely to suffer in more than one-half of the years for which the record is available, while a still larger number would suffer in nearly one-third of the years, for it must be remembered that even a slight deficiency in one month may result in serious reduction

in yield and consequent loss if it occurs at a time when the crop is making its largest development."

The experiment conducted by Prof. Voorhees and reported in this bulletin were for the purpose of determining whether irrigation during these short periods of drouth would result in sufficient increase of yield to pay for the works necessary to obtain the supply of water. The tests were made on small fruits. Careful records were kept of the yield of plats, which received identical treatment, except that some were irrigated and other were not.

The yields of the irrigated plats over and above those not irrigated were as follows: Blackberries, 1,038 quarts per acre, worth $93.42; raspberries, 329 quarts per acre, worth $32.90; currants, 852 quarts per acre, worth $85.20. The increase in yield would not be so marked every year as in 1899, as the drouth of that year was exceptional.

The bulletin contains detailed descriptions and statements of cost for a number of small irrigation plants in New Jersey. All of these are pumping plants. The cost of plants large enough to supply 10 acres of small fruits and garden crops has varied from $230 to $500. Records of the returns from these plants have not been kept, but the owners are all satisfied that their installation has been very profitable, and in nearly every instance have stated that they have made the cost of the plant in the increased crops the first year.

So far as climatic conditions are concerned, New Jersey may be considered typical of the whole eastern half of the United States. Judging from the results reported in this bulletin, there is no question but that irrigation for fruits and market gardens, even in regions of abundant rainfall, is a profitable undertaking.

The work in New Jersey is a part of an investigation of the problems of irrigation now being carried on by the office of Experiment Station in different regions of the United States. Owing to the greater importance of irrigation in the West, where farming is impossible without its aid, the greater part of the work is being done there —Cheyenne, Wyo., being its headquarters. The results in New Jersey show that no agent of agriculture or horticulture is more effective than water, applied when needed, and that the eastern farmer can well afford to pay more attention to the subject.

A limited number of copies of the bulletin will be turned over to the superintendent of documents, Union Building, Washington, D. C., for sale at the price affixed by him under the law.

IRRIGATION IN WASHINGTON.

BY A. A. BATCHELLER.

Several irrigation propositions are being pushed forward in Washington and the adjoining states of Oregon and Idaho. There is a very small percentage of the area of the lands of these states that can be irrigated, and the arable land being largely in the arid part of these states, the question of irrigation naturally comes very prominently to the fore when there is any considerable demand for agricultural lands. The development of the mines of this state and in Alaska have made a demand for agricultural products, especially in the line of butter, eggs, etc., far beyond the ability of this state to produce. No time during the last five years has so much money been sent out of this state for these products as during the present season, and no state has better facilities for their production. The result has been that prices for these products have ruled high all through the season. This is attracting agriculturists from the eastern states, and is bringing in a large number of farmers seeking agricultural lands.

I have been interested in irrigation matters for the last eight years. In 1894, I tried to do something in the line of irrigation by endeavoring to induce parties to become interested in an irrigation proposition that I have in eastern Washington. But on account of the hard times and the price of agricultural products continuing to go down, there was very little demand for agricultural land, and, therefore, no inducement for capital to make investments in this kind of business. I could get no one to take hold of my irrigation proposition, although several times it was pronounced a good one.

It seems to me that now is the time when a first class irrigation proposition ought to attract capital, and be readily taken up.

My proposition covers 20,000 acres of the very best arid land in the state of Washington, at the junction of the Snake and Columbia Rivers in Walla Walla county, and of the lowest elevation, being from 350 to 400 feet above sea level. It also has the warmest average annual yearly temperature of the state, being 55 degrees, taken from a weather record of nine years. The winters are short and mild, from two to five weeks, and the temperature of any winter month seldom going below 32 degrees, and that only from 2 to 4 degrees.

Scientists tell us that the average yearly temperature of 55 degrees is that temperature which contributes to the greatest success in agriculture in the North Temperate Zone.

The total precipitation for the year averages a little over six inches. There are nearly 300 days of sunshine during the year.

The waterto irrigate this land will be taken from the Snake river at a place known as "The Five Mile Rapids;" had a sample of this water and four samples of the soil analyzed at the Pullman Experiment Station, this state. The analysis showed that the soil contained all the elements in a marked degree necessary for vegetable growth, and the water of the best kind for irrigation purposes. The practical tests of this water and soil is shown by the orchards that are grown on the bottom lands along the Snake river which are irrigated by current wheels. These orchards are famous for their wonderful growth and large yearly crops of fine large fruit. Snake river fruit has a great reputation for size and fine quality wherever known.

The flow of the Snake river at extreme low water is 18,000 cubic feet per second of time.

One-half of the 20,000 acres belongs to the Northern Pacific Railway Co. The other half is government land. A few quarter sections have been taken up by settlers, and some of them are occupied.

For irrigation purposes the railway land can be bought very cheap, in the neighborhood of one dollar per acre. The railway company also owns a large tract of grazing land above this irrigable land and below the famous Walla Walla wheat fields which can be bought very cheap, much less than one dollar per acre.

The party, or parties, that would irrigate this 20,000 acres can get 15,000 acres of this irrigable land, purchase 10,000 from the railway company, and obtain one half of the other 10,000 acres for water rights for 5,000 acres. Also purchase from 20,000 to 30,000 acres of fine grazing land which would be very valuable when the other land is irrigated. The land lies in such a position that it can be irrigated with about twelve miles of main canal.

No better arid land and water can be found in any other place in the United States, and, I question if any better climate for health and temperate zone products can be found any where else, and not at a latitude 46° 15 North.

Water in a sure and never failing abundance as long as water flows, with the very best possible title to water rights with no possibility of any one ever disputing these rights, which has been the bane of many an otherwise good irrigation proposition.

I was interested in reading a description of the Pecos Valley, New Mexico, as described in THE AGE for September. I have read considerable about the irrigation works in that valley. In reference to climate, products of the soil, quality of the fruit, variety and production of agricultural products that valley cannot surpass this locality. In some respects in natural resources this locality surpasses the Pecos Valley.

As the railroads are now giving very cheap round trip rates probably many parties will be induced to make a trip out to this country for investigation and investment.

Any one wanting further information can address,

A. A. BATCHELLER, at Townsend, Wash.

THE WISE USE OF WATER.

Except for grass and grain crops water should not be used by flooding, and it certainly should not be in the preparation of the ground for the planting of either of them.

There are certain crops upon which the water may be used with impunity so far as touching the plant is concerned. Some of the stronger of the garden vegetables will not be injured by any use of water, while others will certainly be, if the water is allowed to touch the stem of the plant. As a matter of safety let no water touch any plant or the bark of any tree or shrub. Under the best circumstances it does no good, and is certainly liable to do injury.

It should be remembered too, that running water upon the surface of hard baked land, or of rain washed land, under a hot sun, will be attended with almost as rapid evaporation as it would be if poured upon the top of a hot stove, nor is its effect advantageous to the surface of the soil when so applied. If, on the other hand, the surface be broken so as to apply the water to the cool under soil, the absorption is much more rapid and more thorough, and then, with the pulverized surface soil, no matter how dry, thrown back upon it, will serve to retain it there many times longer than it will if applied broadcast.

In watering alfalfa, if the water is applied about a week before cutting while the ground is shaded, and consequently cool, and especially if it is applied at night, the grass will be in much better condition for cutting and will start more promptly after cutting by far than to wait until after it is cut before watering. Then, if as soon as the hay can be cleared from the ground, a harrow be run over the surface to break the surface while it is soft, and there be another application of water, say two or three weeks after the previous one, it will certainly make a very great difference in the yield of the crop. One watering intermediate between this and the watering at cutting, will invariably insure a good crop of hay.

The most useful tools that can be used is the disc cultivator. With these, land in reasonably fair condition can be thrown into ridges about four feet apart, either rounding ridges or sharp ones. In preparing land, best results come from throwing the ridges as high as possible, or at least leaving the dead furrows between as deep as possible and apply the water in these furrows. Run furrows all the way across the block, where the slope of the ground permits, running the furrow as full as possible until it has nearly reached the lower end, and there

shorten the supply so as to run just as much as the ground will absorb by the time it reaches the lower end of the furrow.

A little stream left in this way for five or six hours will soften almost any of this ground so that it will mire a horse, and will use, in doing so, little more than half the water that would be required, if applied on the surface; and a good irrigator can run ten or twelve of these furrows at a time, and can irrigate more land with less labor, and more uniformly, than he can by flooding. With the same cultivator, with the discs straddling the dead furrow, the ridges of dry earth are thrown down over the water furrow as soon as it is dry enough for the team to travel over it. Then by harrowing the ground smoothly, the surface is left thoroughly pulverized and to a depth of six or eight inches is as mellow as ground need be for any crop. Ground watered in this way need not be watered oftener than once in six weeks, and no matter how hot the weather, moisture will be found within half an inch of the surface at any time, and plants will thrive in it. Of course such ridges can be made by the ordinary plow, but not so cheap.

Plant on the leveled ground with planters after this preparation, and there is moisture enough to bring any plant up and give it a rapid growth until it is from six to twelve inches high. As soon as the plant is large enough, put the cultivators in for simple cultivation, throwing up as little ridge as possible. Two or three weeks later run the cultivators through again, and then water in the dead furrows between, following watering by another cultivation with the discs set with a view to leveling down the ridges as much as possible.

There should be at least one cultivation between the waterings, and two will be preferable. The finer the surface soil is kept the longer will the ground retain moisture, and the more mellow and pliable will it be to a depth of from twelve to eighteen inches.

The general rule would be, keep the water off the surface, get it underground from the outset; keep it entirely away from the plants, trees and vines, and use as little as practicable to keep the soil in good growing condition.

NATIONAL IRRIGATION CONGRESS.

The indications are that the coming ninth annual session of the National Irrigation Congress, which will meet in Chicago Nov. 21 to 24 inclusive, will mark a turning point in the history of the national irrigation question in the United States.

For a nnmber of years the national irrigation movement has been steadily growing and advancing its lines from the western country, where irrigation means life, into the East, where the problem of land reclamation through the application of water is but little understood. The crest of the wave which marks a new era for national irrigation is seen in the interest which is being evinced in the movement by eastern manufacturers and commercial houses, who see in the general western reclamation of the desert a greatly increased home market for their various lines of goods and manufactures. The co-operation and support of the eastern business man in the direction of water storage means a distinct and tremendous gain to the national irrigation movement.

The ninth annual session of the Congress, it is evident, will be a business men's Congress. Instead of discussing abstract theories of irrigation and water conservation with long scientific articles and well rounded speeches generalizing on the stupendous possibilities, enormous wealth and inconceivably great future of the West through the reclamation of vast areas of now uninhabitable aridity, this Congress proposes to get down to business and simply work out, endorse and push a plan of action by which something definite can be accomplished.

"Save the Forests and Store the Floods," has been adopted as a motto for the Convention and the discussion will probably be in the lines of how to get at this work and do it.

An excellent program has been arranged which includes addresses by some eminent men in political, official and business circles. Some of the sessions will be at the Auditorium Theatre which has a capacity of four thousand, and the indication of attendance point to no empty seats.

The following paragraps are taken from the *Call*, which has just been issued by the Congress:

"The ninth annual session of the National Irrigation Congress will be held at Chicago, Ills., on Nov. 21, 22, 23 and 24, 1900. The

Congress will convene at 8 o'clock P. M. on Nov. 21, at Central Music Hall, cor. State and Randolph streets.

"In this session of the National Irrigation Congress all disputation and controversy should be eliminated. Its deliberations should be guided by a high purpose and a united determination to arouse the whole people of the nation to a realization of the national importance of transforming the western desert from uninhabitable wastes into fertile and populous territory.

"The magic touch of water will work this transformation. The conservation of the water supplies must therefore be first accomplished. The forests, which are nature's storage reservoirs, must be preserved and the waters that now go to waste in destructive floods must be stored in great reservoirs and saved for beneficial use. The national government is the only agency through which this can be accomplised.

"The Chicago Irrigation Congress should be a great gathering of representative men of the country, and governors, mayors, Boards of Supervisors, County Commissioners, Chambers of Commerce, Boards of Trade, Agricultural Colleges, Irrigation, Agricultural and Horticultural Associations, Engineers' Societies and Irrigation Companies are requested to appoint delegates at once who will attend and take part in the proceedings of Congress.

BASIS OF REPRESENTATION.

The governor of each state and territory to appoint 7 delegates.

The mayor of each city of less than 25,000 population, 2 delegates.

The mayor of each city of more than 25.000 population, 4 delegates.

Each Board of Trade and Chamber of Commerce, 2 delegates.

Each agricultural college, 2 delegates.

Each organized irrigation, agricultural and horticultural association, 2 delegates.

Each society of engineers, 2 delegates.

Each irrigation company, 2 delegates.

In addition to the foregoing the following persons are delegates by virtue of their respective offices:

The duly accredited representative of any foreign nation or colony. The governor of any state or territory. Any member of the United States Senate and House of Representatives. Member of any state or territorial commission.

SOME REASONS WHY THE COUNTRY SHOULD ANNEX ARID AMERICA.

The Secretary of the Interior in his annual report for 1899, says of the irrigable area of the arid region of the United States: "That this vast acreage, capable of sustaining and comfortably supporting under a proper system of irrigation, a population of at least 50,000,000

people, should remain practically a desert, is not in harmony with the progressive spirit of the age or in keeping with the possibilities of the future."

The Secretary of Agriculture in his annual report for 1899, says: "More than one-third of the country depends upon the success of irrigation to maintain the people, the industries, and the political institutions of that area, and future growth will also be measured by the increase of the reclaimed area. In a region which, in the extent and diversity of its mineral wealth, has no equal on the globe, the riches of the mines in the hills are already surpassed by the productions of the irrigated farms in the valleys, and the nation at large is at last awakening to the fact that the development of the use of the rivers and arid lands of the West will constitute one of the most important epochs in our increase in population and material wealth."

Capt. Hiram M. Chittenden, Corps of Engineers, U. S. A., says in report on surveys for reservoir sites: "Reservoir construction in the arid region of the West is an indispensible condition to the highest development of that section. It can properly be carried out only through public agencies. Private enterprise can never accomplish the work successfully. As between state and nation, it falls more properly under the domain of the latter."

Elwood Mead, in charge of the Irrigation Investigations of the Department of Agriculture, in Agricultural Year book, 1899, says: "The commercial importance of the development of irrigation resources is being realized in the West at the present time as never before. * * * The East, as a whole, is beginning to realize the great part which the West is to have in the events of the twentieth century. World-wide forces are working to hasten the day of its complete development and the utilization of all its rich resources. The Orient is awake and offering its markets to the trade of the Pacific Coast.

"With the development of this trade there will come an impulse for the completion of the material conquest of Arid America, by the enlistment of public as well as private means in the storage and diversion of its streams for the irrigation of its hundred million acres of irrigable soil; the harnessing of its water powers to mill and factory wheels, the crowding of its pastures with new millions of live stock; the opening up of its mines and quaries; the conversion of its forests into human habitations; the coming of a vast population, and the growth of institutions worthy of the time and place."

Frederick H. Newell, Hydrographer of the U. S. Geological Survey, in Survey of Reservoir Sites, says: "Water storage on a large scale can rarely be made profitable to individuals or corporations. * * * Existing conditions, laws and customs are such that the person who builds a dam on the head waters of a stream is rarely

in a position to be benefited financially by the water which he impounds.

"While reservoirs in general cannot be made sources of profit to the investors, there is no gainsaying the fact that they are indispensable to the community. They may be classed with lighthouses and works of internal improvement, which, under existing laws and customs, cannot be made sources of private gain, and yet must be had if a full development of the natural resources is to be obtained."

PORTRAIT OF A CHILD.

Sargent's Beatrice.

Rose of childhood, sweetest rose,
That on a painter's canvas glows,
  Light of innocence and grace
  O'er the flower-tinted face;
With a shadow of surprise
In the sweet and pensive eyes,
  Fillet-clasp of golden hair,
  Ribbon, pink as petal rare,
Spirit, thou, or dream-caprice
Figure quaint of Beatrice?

Hast thou seen, A fairy child,
Gretel of the forest wild,
  Heard the talking leaves repeat.
  Secrets of their dim retreat?
Harkened to the fountain call,
Music of the Parsifal,
  Saw the brownies vanish quite—
  From the beams of jocund light?
Spirit-vision, dream-caprice
Figure quaint of Beatrice!

This thy Little Self shall be
Ever young immortally!
  Time nor sorrow leave their trace
  On the the pure ideal face,
In the eyes, that sweet express
Childhood's love and happiness.
  What thy thoughts the moment while
  Artist gave the world thy smile?
Who can fathom thy caprice—
Living, loving Beatrice!

ISADORE BAKER.

IRRIGATION IN NEBRASKA.

A line drawn in a southwesterly direction across the state of Nebraska from the northeast corner of Knox county to the southwest corner of Furnas county, traverses approximately the medial line of a belt receiving an average mean rainfall of about twenty-four inches per annum. To the east of this belt the precipitation is greater, while to the west it decreases in a regular ratio. The line above referred to may be accepted also as the line of demarkation between the humid and the semi-humid portions of the State, The humid region of Nebraska, as thus defined, comprising about 32,000 square miles of territory, contains a million inhabitants, and is unexcelled in agricultural resources as compared with any other State in the Union. Its soil is fertile to a degree; every cereal and other product known to the temperate zone can be cultivated here with the assurance of a harvest as abundant and certain as that which befalls any other region of the world of the same latitude. If Nebraska only included its humid counties alone it would still be a great State, exceeding in area West Virginia, Maine or South Carolina; it would contain four times as many square miles as the state of Massachusetts, and its extent would be but one-fifth less than that of Ohio, Tennessee, Virginia, or of all the New England States combined.

But Nebraska is all this and more. To the west of the line above mentioned are 44,000 square miles of magnificent prairie lands, carpeted with grasses that render this section one of the finest stock ranges of the great West. With the exception of about 15,000 square miles, which compose the sand hill areas of this part of the State, the fertility of the soil is as great as that of the lands just west of the Missouri river, and in years of plentiful rainfall the crops produced in this region have been the envy of the farmers of the humid section of the State. While the climate of this portion of Nebraska is delightful, the rainfall is uncertain, and for this reason the settlement of the buffalo grassed table lands lying between the Platte and the Republican rivers has been the source of disappointment and misfortune to those who were lured thither by the smiling prospects of the dark green prairies in June. But experience alone is the great teacher of the limitations and possibilities of development in the unpopulated regions of the new world, and so it came that a hundred and fifty thousand people found themselves located in the semi-humid portion of Nebraska before it became notoriously evident that the uncertainty of rainfall in that part of the state renders agriculture, as a pursuit, uncertain and hence unrenumerative.

Whatever may have been the former hopes for Western Nebraska as a rain belt agricultural region they have all been dispelled by the short crops harvested since 1890. The people of the east have heard much of the suffering and misery due to the drought and hot winds, and to those unacquainted with the situation it has been the impression that the misfortune was a general one throughout the State. While it is true that agriculture was far from renumerative, even in the eastern counties, during 1894, yet it is equally true that suffering and privation was confined almost if not wholly to the semi-humid region, as above defined. Eastern Nebraska is no more subject to droughts than Michigan, Ohio or Indiana, but in the western counties of the State it must be acknowledged that agriculture without the aid of irrigation is so uncertain in its returns as to render its pursuit, to say the least, undesirable. This conclusion was practically reached some years ago, and since that time the progress of irrigation in the great valleys of the State has been remarkable indeed.

Nowhere in the semi-arid region is the altitude so favorable, the available water so abundant or the problem of reclamation so simple as in Western Nebraska. In considering locations, altitude is often lost sight of by the unitiated, and yet, this is a factor that has a most important bearing upon the success of agriculture in the arid West. Those looking for irrigated lands, however, need have no misgivings upon this score so far as Nebraska is concerned, for so favorable is the elevation of even the high table lands in the extreme western portion of the State. that whenever sufficient moisture is present corn can be grown equal in quantity and quality to any produced in the vicinity of the Missouri river.

Excluding the Platte river there are four water sheds from which water supplies can be obtained: those of the White, Nobrara, Loup and Republican rivers, affording in the aggregate several thousand cubic feet per second. The Platte river, which alone has its source in the mountains, is a peculiarly favorable stream for irrigation purposes. Not only does its flood season occur during the months of June and July when its discharge varies from 6,000 to 12,000 second feet, thus coinciding with the period of greatest use, but its declivitv, like that of most western streams, is relatively great and its banks low. Here, as in the other valleys of the State, little or no rock that cannot be plowed, is met with in the construction of canals. The broad level bottom lands and benches afford especially advantageous opportunities for the use of graders in the removal of earth. As a consequence, earth work is cheaply done and the cost of reclamation correspondingly slow. When we add to these facts the additional fact that there is a population in the semi-humid region exceeding that of Montana, or that of Wyoming and Idaho combined, the causes responsible for the

rapid advancement of the irrigation industry in the State are rendered apparent.

The first considerable canal was constructed in 1883, in Lincoln county in the vicinity of North Platte, yet little water was used therefrom until in 1889 and 1890. Since then, however, the use of water has rapidly increased and the number of canals so multiplied that in October of 1894 there were, according to the report of the State Commissioner of Labor, 689 miles of canal completed, covering in the neighborhood of 360,000 acres of land, or more than half as much as was under ditch in Utah in 1890, as stated in the National Cencus of that year. If we assume that the cost of reclamation averaged $3.00 per acre, then upon the basis of the figures above given, the recent activity in the irrigation industry of the State means an investment of more than $1,000,000 within a period of less than four years. When we consider the expenditure and the amount of land reclaimed, it is doubtful if this record has ever been equaled by any other state of the great West.

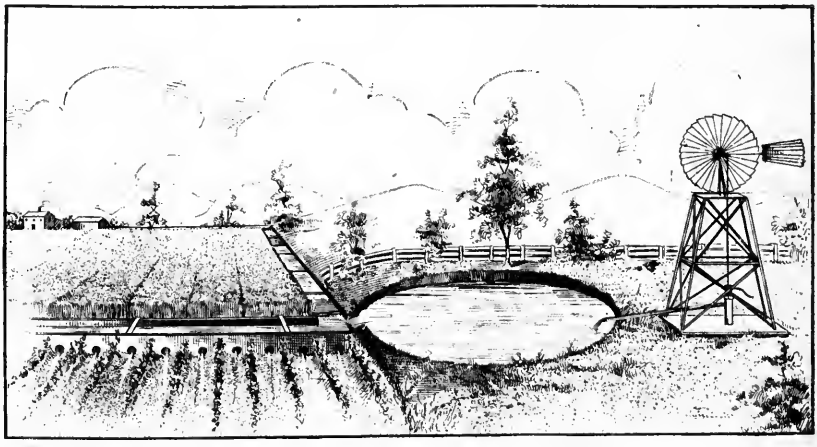
The first laws designed for the encouragement of irrigation development in Nebraska were enacted by the legislature of 1889, and though meager in detail and narrow in application, yet they were found sufficient to meet the demands of the situation. Under this statute the right to the use of water from streams exceeding fifty feet in width was secured by posting a notice of appropriation at the point of diversion and filing the same with the County Clerk. Hundreds of these notices are now on record in the various counties of the State, and one of the first duties devolving upon the present Board of Irrigation is the adjudication of the rights and priorities of the numerous claimants represented.

The inadequacy of the St. Raynor law—as this act was called—soon became apparent, and the two succeeding legislatures were applied to for relief. It remained, however, for the legislature of 1895 to fully recognize the importance of irrigation, and place it upon that sound foundation that was necessary for the continued development of the industry. As a result of the untiring efforts of Senator W. R. Akers, of Scotts Bluff county, two bills were passed, and an appropriation secured to make them effective. The first, known as the control bill created a State Board of Irrigation consisting of the Governor, Attorney General and Commissioner of Public Lands and State Engineer and Secretary. An assistant secretary and two under-secretaries were also provided, with an additional provision for under-assistants in each of the water districts of the state that may be hereafter created. One of the first duties of this Board, as already stated, is the adjudication of the rights and priorities of the claims now on record. In addition thereto, the State Engineer is required to receive and pass upon applications for the appropriation of water and the construction of new

ditches. And further, to supervise the division of the waters of the state among the various claimants in accordance with the Board's decrees.

The second bill was modeled after the "Wright" law of California, the provisions of which are so well known as to require no description here. The effect of this legislation is already apparent; a number of irrigation districts are now organized or in process of organization.

In view of the results thus far achieved, and the flattering conditions under which further progress will be made, the friends of irrigation are fully justified in contemplating with complacence the future of that industry in Nebraska. Though, for lack of water, it may not be possible to eventually reclaim more than six or seven per cent of the 30,000,000 acres embraced within the semi-humid portion of the state, yet the intensive cultivation of this seemingly small area will place Nebraska in the front rank of the irrigation states, and in connection with the stock growing interests, assure the livelihood, contentment and happiness of a half million people west of the hundredth meridian.



THE DIVERSIFIED FARM.

HOW TO RECLAIM AN ABANDONED FARM.

Mr. Arthur B. Clapp, of Brattleboro, Vt., is the possessor now of the farm near West River on which his great grandfather settled in 1765. It was by no means an abandoned farm when it came into his possession, having good buildings and carrying a stock of thirty head of cattle, besides horses and swine and a lot of fowls; and there are twelve acres of corn and fourteen acres of oat fodder growing, with an expected crop of sixty tons of hay, at least 300 bushels of potatoes, 100 barrels of winter apples and other smaller crops. But Mr. Clapp is a practical farmer and believes that a man can reclaim an abandoned farm and make it profitable while doing so.

He says: "The first thing I would do would be to provide sufficient fertilizers, and begin in the spring of the year. If without capital a man should be thrifty enough to procure cattle to stock his pastures. He should plant an acre of corn for each head. The cattle should be stabled nights to secure the manure. Every farm has a muck bed, and this should be drawn out in a quantity sufficient to use as an absorbent in stables and yards, for which purpose it is one of the best and cheapest. The herd should be mostly of cows, and the milk might be turned into butter. A separator should be used if there were means to buy it, and the cream might be sold to a creamery. The skimmilk should be fed to calves and pigs.

There is more money in poultry for the amount invested than in anything else if they are properly cared for. Good fences are absolutely essential to good farming. If there is a sugar orchard it should be kept up, as sugar is made at a time when other farm work is not crowding. The time is coming when sugar and syrup will bring in a good income. Fruit trees should receive the same attention as any other crop, so far as working the ground and fertilizing it goes, and the trees should be kept well trimmed and healthy.

"The second year the fertilizers should be put on the land where corn had been grown, and it should be seeded to oats to be harvested in the milk, while more land should be broken for corn. This process should be repeated for three or four years, increasing the herd as the fodder crop increases. In this time enough should be saved to pay for all the dairy implements, and all necessary labor-saving implements for the farm. Milk should be made the chief product, and if one understands the art of butter making it should be the most profitable way of disposing of the milk."

With most of this we would agree, but if we had to reclaim a neglected farm we would wish to begin in the fall, not only that we might do some fall plowing, but get ready in many other ways, and especially in preparing for a good garden, even though we were too far from market to sell many of its products. We have taken a run-down farm in the spring and found so much to be done that we felt like Hamlet's uncle, who said, "like a man to double business bound, I stand in pause where I shall first begin, and both neglect."—*American Cultivator.*

SILO ON A SMALL FARM.

Having a small farm, and consequently a small dairy, yet believing that a silo is a necessary adjunct of a dairy farm, I studied to see how I could build economically. My barn where my cows are kept, is about 30x40 feet with the cow stable on the east end, a driveway floor through the center, and a bay in the northwest corner. It was here that I decided to build my silo. After tearing out the floor, etc., I excavated four feet below the sills. The posts of the barn are fourteen feet. This gave a chance for a silo eighteen feet deep. Its surface is 15 1-2x18 1-2 feet. Studding were set up where needed to strengthen the walls and crosspieces were nailed to these, about three feet apart near the floor and further apart near the top. Hemlock boards were nailed up and down to these and then double boarded with spruce, taking care to break joints, but using no paper between. Neither were any of the boards planed. The floor of the silo was cemented. A door was left next to the feeding or driveway floor. This was closed by a single thickness of matched boards placed horizontally across the opening as fast as filled and taken out as the ensilage was fed. The lumber was cut on the farm and much of the work, including getting the lumber to the mill, I did myself. The actual money paid out would not exceed $25.

The silo was built in 1896 and has been filled four times; in 1896 and 1897 it was filled with cut silage. This spoiled some around the edges near the top and a little in the corners, but I do not think the spoiled material was equal to the interest on the extra cost of a more expensive silo. It is a cold place and the silage freezes quite badly, sometimes as much as eight or ten inches being frozen all around the sides. In the spring, as fast as this thaws, it is fed. I have never seen any difference in the feeding value of that which had been frozen as compared with that which had not. In 1898 I was unable to secure a cutter, and against my better judgment I filled the silo with uncut corn. The corn was mostly Sanford, and a very heavy growth, many stalks being ten feet long and over and heavily eared. This made it heavy to handle and very difficult to pack in the silo. Much care was taken in packing. Beginning at one end the butts were placed next the outside and a layer placed across the end; then beginning another layer the butts were placed two feet from the end and so on, shingle fashion, the entire length of silo. The tops of the last layer were doubled over and a bundle laid crosswise. Then a new layer was begun on this end, and so on until done, but in spite of my care the silage spoiled badly and was very hard to take out. Not only this but the cows do not eat it as readily as they do the cut ensilage, so there is considerable waste in this way. From my experience I should say it is doubtful economy to fill a silo with whole corn to save the cost of a cutter. The principal silage crop in Vermont is corn. The most common variety is the Sanford, a large flint sort that in the state rarely matures (the seed being obtained from the southern part of the state and Massachusetts), but it generally reaches the roasting stage, and this is usually considered the proper condition for silage. As it contains a good proportion of ears it makes capital silage. I believe the silo is the proper place for the entire corn plant.

I believe there are few dairy farms that can afford to be without a silo. Also that an expensive silo is not necessary. But good silage and clover hay are, in my judgment, the cheapest feeds for the dairy farmer. If it were practicable I would not cover the silo at all, but begin feeding as soon as it was filled I have done this way and like it very much, but have never been able to cover it so as to prevent there being more or less spoiled silage. I usually feed about forty pounds per cow daily

in two feeds, morning and evening the grain ration with the silage and giving a small foddering of hay directly afterwards. No other feeds are given during the day. With this manner of feeding silage I have had good results and I firmly believe that it will pay any farmer who keeps cows to have a silo.—Practical Farmer.

ENCOURAGING THE FARMER.

Secretary of Agriculture Wilson, in view of the crop estimates which his experts have made, looks for rising prices. "The outlook for good prices," he says "was never better. We have a shortage in the American wheat crop this year which will probably amount to a hundred million bushels in all. This alone would serve to make the present yield more valuable. There are additional reasons, however, which incline me to believe that wheat will make a marked advance before the end of the present year. There is unexampled prosperity throughout the country to-day, and the prospects are that the present year will be a record-breaker. This has been best instanced, perhaps, in our enormous export of manufacured goods of various descriptions, while the trade balance is all our way. But our home market is, and will continue to be, the greatest wheat market in the world. This year the demand for the great bulk of our crop is at home, and the people have the money with which to pay for whatever breadstuff they desire.

"Not only will our people be the best fed people in the world during the present year, as they have been in years past, but they will be better fed than they have been in years past. They have plenty of money to buy all the wheat they want for bread and will have flour left over for cake if they want it. Hard times directly affect the price of wheat by decreasing the demand, and at the same time cuts off the consumption by decreasing the buying power of the people. The consumption of wheat per capita this year will go above last year and will probably be nearer seven than six bushels, because this year the people are better able to buy than ever before, as the mills and factories are going everywhere and labor is receiving more general and more generous employment than ever before. Moreover, the farmers themselves are getting good prices for all their products and will not be forced to stint themselves in their food supplies and in their buying, as formerly. The shortage and the increased domestic demand will make foreign countries who buy wheat pay more, and the price must advance.

"It will probably be advisable for our farmers to feed much of their corn this year to sheep, horses, cattle and hogs, as the price of meat is high and the outlook for a continuous demand for our meat product, both at home and abroad, is excellent. Germany can exclude our meat on whatever pretext she pleases, but if she is going to feed meat to her soldiers in China she must buy it in Chicago. Moreover, our meat is the best in the world. With the stimulus which our foreign commerce is getting, and the introduction of our manufactured goods into other markets, the home demand for all food products must grow and steadily increase. Moreover, we may look for an increase in the average price of our farm products from this time on for the same reason."

BIG OREGON HOP CROPS.

In the opinion of the well known hop buyers in Aurora, Ore., the hop crop of the state will reach at least 90,000 bales, an increase of about 10,000 bales over the yield of 1899 Exact figures are not yet obtainable. but the buyers say that reports so far received warrant the foregoing statement; also that the hops are of fine quality and sell readily at 14 and 14½ cents a pound, with a few sales at 15½ cents. Last year prices ranged from 4 to 6 cents per pound, or less than choice '99 hops bring today.

PULSE OF IRRIGATION.

IRRIGATION IN THE EAST.

Through the kindness of C. P. De Field we are able to present to our readers the following description of an irrigation tank, built by him at his place in Fieldhome, N. Y., together with illustrations of same.

"The walls of the tank are of Portland cement concrete, two feet thick at the top and four feet thick at the bottom, most of the bevel being on the in or water side, to allow the ice to lift rather than squeeze out the sides The tank is four and a half feet deep with right angled corners aud should hold fifty thousand gallons when full. There is a spring within twenty feet of the tank and an inch bored well just outside of the wall. We have a pump (hot air) using kerosene for fuel, ready to erect, that will pump water from the well into the tank or take water from the tank and pump it into the house some 100 feet above the tank or pump it into any of the irrigation ditches of the garden which is over half a mile long (to avoid many turnings of the animal worker.)

When the tank was first completed it was very dry and the spring extremely reduced and while the concrete was hardening the walls became so warm that the

production of the spring for the first week was entirely evaporated until a shower cooled the walls sufficiently to allow the water from the spring which is a few feet above the tank top, to cover the bottom.

Having a plentiful supply of water for domestic purposes from several good wells I have used a sewerage pump to empty the cisterns on the lawns with marked success. Truly the western expression that rain is a poor substitute for irrigation has been demonstrated here this season. We are debating now whether to catch the rain water from the building which is nearly two hundred feet long and fifty feet wide, in cisterns or uncovered tanks for basins with equatic plants. Stones and spalls costing only the drawing not over a mile and a half we are peculiarly well situated for doing concrete work and expect to use a thousand barrels of Portland cement this season; we were able to buy it put into our buildings and piled up, for two dollars and twenty cents a barrel, while the local dealers were keeping the price at over three dollars a barrel. We have several good floors (on beams) of concrete, one roof and one floor over a stretch of nearly thirty feet that is an arch and that was put up last fall and seems to stand admirably. One roof has a crack in it, but it was done in freezing weather by using salt in the mixtnre and we did not then know that concrete floors and roofs should, to use an Irish expression, be kept wet till dry i. e. made to dry very slowly by keeping damp bags all over the top."

IRRIGATION PAYS.

"Myriads of instances could be adduced in this semi-arid region to approve the assertion that irrigation pays," says the *Citrograph*. "It is the common belief however, that in the moist—or humid—regions, irrigation does not pay. We of the irrigated section are firm in the belief that irrigation pays, even in the humid region, and such a statement as this, which we find in the Vacaville *Reporter*, goes far towards showing that our contention is the correct one."

"The benefits to be derived from irrigation are well illustrated in an experience of Frank Buck this season. On his upper place he has a tract of canning peaches. Without irrigation this year it would probably have produced about 400 lug boxes. With the amount of water put on this was increased to over 1700, an increase which well pays for the expense and trouble of pumping the water applied to the tract. Doubtless, the experience of others is in the same direction. Irrigation pays. Of that there can be no doubt even in season when this locality has a normal rainfall of thirty-five inches.

When the people all over the United States once become convinced of the fact that irrigation pays, we shall have no difficulty in getting any needed amount of appropriations from both nation and state for the building of catchment reservoirs for the conservation of water for dry seasons."

WOULD ASSIST THE WEST.

That eastern business men are genuinely alive to the importance of western arid land reclamation is shown by the continuons press reports of the actions of various business and commercial organizations endorsing the national irrigation movement, and urging the reclamation of the arid region. The recent action of the executive committee of the National Business League at Chicago, whose membership represents tens of millions, is an example. Strong resolutions were adopted urging upon congress the preservation and development of national resources by the construction of storage reservoirs by the federal government for flood protection and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction, and for the reclamation of the arid public lands. Also, the necessity for the preservation of the forest and re-

forestration of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies and the united ownership of land and water.

The resolutions embodied a specific demand for an annual appropriation of not less than $250,000 for irrigation surveys and maps of irrigable public lands, with plans and estimates of costs of reservoirs, canals and irrigation works necessary for their reclamation and for sinking experimental artesian wells by the United States Geological Survey, and of not less than $100,000 for irrigation investigations by the Department of Agriculture of the United States.

The National Business League is sending copies of these resolutions to all the multitude of commercial organizations in the United States, with a request for their endorsement of the national policy set forth therein, and asking for their cooperation to secure the support of of their senators and congressmen for said policy and for the said appropriations to carry the same into effect.

GUY E. MITCHELL.

IRRIGATION DECISION.

The suit of Miller & Lux and the San Joaquin and Kings river canal and irrigation company against the Enterprise canal and land company and others and J. C. Mowry, intervenor, which was submitted on briefs in Judge Webb's department of the superior courts several weeks ago has been decided. The suit was really a contest between Henry Miller and Jeff James for the waters of the San Joaquin river and neither of the parties will find much consolation in the judgment, which was virtually against both.

Miller & Lux, who have defied the law for years by damming up the San Joaquin at the point of confluence with the Fresno slough, brought injunction proceedings to restrain James from tapping the river near the old California ranch above their dam, claiming that they would thereby be deprived of the water. To support the injunction proceedings they set up two claims—(1) that they were entitled to the water by right of prior appropriation and prescription founded upon long continued user and (2) that their lands were riparian to the river and that the land of James was not. The latter contention was supported by the court and the injunction against James was made perpetual, it appearing that he wished to divert the waters of the river for the purpose of irrigating lands riparian to the Fresno slough but not to the San Joaquin. Judge Webb, however, emphatically denied the first and most important part of the Miller & Lux claim, that they had a right to the waters of the river by prescription.

The various parts of the decision are as follows:

"First—That the plaintiff, the San Joaquin and Kings river irrigation company, takes nothing by its action in this matter as to its claims of a right of diversion of the water from the San Joaquin river.

"Second—That judgment in favor of the Miller & Lux corporation, and the intervenor, Mowry, be entered against the defendants, enjoining each and all of them from diverting any water out of or from the San Joaquin river.

"Third—That judgment be entered in favor of the San Joaquin and Kings river irrigation company, in so far as its right as a riparian owner is concerned, in this action against the defendants enjoining each and all of them from diverting any water out of the San Joaquin river.

"Fourth—That each party pay their own costs herein.

Miller, of course, is the soul and spirit of the San Joaquin river canal and irrigation company and the part of the decision

applying to that company applies to him. The important part of Judge Webb's ruling is that while it gives Miller an injunction against James it is only because James wished to apply the water taken from the river through the enterprise ditch to lands not riparian to the San Joaquin. In other words, Miller has not a right to restrain the diversion of water for irrigating lands along the river, as he would have had if the court sustained his prescription claim.

Judge Webb held that the San Joaquin river is a navigable waterway and that anything interfering with its navigability is unlawful such as the diverting of water by means of a dam. The act of the plaintiff, the San Joaquin and Kings river company," says the court, "being unlawful from its inception it can never found a right on an unlawful act and I am of the opinion that the company is not entitled to recover in this action for any acts complained of by the defendants for interfering or threatening to interfere with the diversion of water from the San Joaquin by said plaintiffs."

Webb held that it devolved on the defendants to show that their diversion of water from the San Joaquin did not interfere with Miller's riparian rights and that they had failed to do so. He therefore granted the perpetual injunction with the proviso, however, that James and the enterprise company might sue Miller and the intervenor to determine under what circumstances they might divert water without injury to the plaintiffs."

Short & Cook and Houghton & Houghton of San Francisco represented the plaintiffs. James was represented by Archie Borland, N. C. Coldwell and W. C. Graves. A. S. Treadwell of San Francisco looked after the interests of the intervenor, Mowry.

TO STORE SIOUX RIVER WATER.

Col. H. M. Chittenden, United States engineer at Sioux City, has just returned from Watertown, S. D., where he investigated the matter of the projected reservoirs in which to store the surplus water of the Sioux river in springtime and release it when wanted during the drier portion of the year. The colonel will report favorably to the war department on this subject. The plan is to construct a dam across the Big Sioux river, so as to back the interrupted waters into Lake Kampeska. During the summer, when tock is looking for water along the courses of the stream, the stored water will be let out and the river be thus made a running stream during the whole year.

WITH OUR EXCHANGES.

THE FORUM.

The November number was evidently issued before the outcome of the recent election was known since two of the leading articles are: "Why the Republicans Should be Endorsed," by Chas. Dick, and "Reasons for Democratic Success," by Chas A. Towne. Both are well written but not of so much interest as they would have been a few weeks previous. Geo. E. Roberts, director of the United States mint writes on "Can there be a Good Trust?" Archer Brown discusses "The Revival and Reaction in Iron," while the advantage of having mounted infantry in modern warfare is ably handled by Maurice A Low under the title of "Four Legs Instead of Two." "Bread, and Bread-making at the Paris Exposition," by H. W. Wiley; "The United States and the Australasian Federation Compared," by Sir Robert Stout, K. C. M. G.; and "The English Intelligence Department," by Major Arthur Griffiths, are a few of the other articles which go to make up an excellent number.

REVIEW OF REVIEWS.

In the editorial department of the November number the result of the presidential compaign is compared with that of 1896, and the following are a few of the subjects taken up in connection: "The Ebbing of the Free Silver Tide;" "Silver in the Campaign;" "Local Politics as a Factor;" "Mr. Bryan as the Paragon of Statesmanship," etc. The situation in England and the election in Canada are also discussed in this department, which is enlivened with the customary cartoons. The frontispiece is an illustration of the scene at Mr. Crocker's banquet to the democratic candidate. Among the contributed articles are "The Hall of Fame," by Henry Mitchell MacCracken; "The Political Beginnings in Porto Rico," by John Findley; "Trusts in England," by Robert Donald and "The British Czar, the General Elector," by W. T. Stead. Two other articles which must not be forgotten are "How the Republican National Committee Works for Votes," and "The Management of the Democratic Campaign." The number is one of unusual interest.

SCRIBNER'S.

Scribner's for November contains Henry Norman's article on the "Great Siberian Railway;" J. M. Barrie's great serial, "Tommy and Grizel;" an article on "Famous Writers" by Mrs. Rebecca Harding Davis. The World's Fair in Paris is pictured and described from the points of view of an expert landscape gardener, Mr. Samuel Parsons, Jr., and an expert amateur photographer, Dwight L. Elmendorf; a poem by Benjamin Paul Blood, entited Tithonus, etc.

THE SATURDAY EVENING POST.

The opening article is The Leaders in Ameriean Diplomacy, by Hon. John W. Foster, formerly Secretary of State. Hon. Frank A. Vanderlip, Asssistant Secretary of the Treasury, contributes The Onward March of American Trade. Hon. Carter H. Harrison, mayor of Chicago, has an article on "The Defacement of the Modern City. Major Arthur Griffiths, of the British Army (retired), has an anecdotal sketch of Gen. Wolseley, The Adventures of a Pioneer Plainsman are told by Capt. John J. Healy. The fiction includes Senate Bill 578, by Brand Whit-

lock; For Divers Reasons, by Charles Battell Loomis; The Banner Bearer, by Mrs. Burton Harrison; The Dairy of a Harvard Freshman, by Charles Macomb Flandru; Mooswa of the Boundaries, by W. A. Fraser; 'Enry 'Iggins' 'Eart Story, by Joe Lincoln; A Supper by Proxy, by Paul Laurence Dunbar.

THE HOUSEHOLD

for November is noteworthy. The stories are from such well-known writer as Sophie Swett, Will Allan Dromgoole, and J. L. Harbour. There are illnstrated articles by Col. T. W. Higginson, Kate Sanborn, and Fannie Bullock Workman—the only woman who has climbed the Himalays. The illustrators for the month are Chase Emerson, H. W. Colby, Louis Maynelle, and E. Jepson.

THE LADIES' HOME JOURNAL

for November contains The Loveliest Woman in All America, The Future of the White House, The Man Who Wrote Narcissus, Waiting for the Mail—a page drawing by A. B. Frost—and How Aunt Sally Brought Down the House, a short story, are some of the excellect features. In the same issue Clifford Howard continues The Story of a Young Man; Charles Major his Blue River Bear Stories; Elizabeth Stuart Phelps her serial, The Successors of Mary the First, and Josiah Allen's Wife, finally narrates the incidents of her fourth visit. Edward Bok forcibly contends that the Americans show execrable taste in furnishing their houses, and An American Mother, convicts the Americans of having bad manners. Plans are given for A Quaint, Old-Fashioned House for $6600, and interior views of The Most Artistic House in New York City, right worthily occupy two pages, as does Through Picturesque America, which pictures the scenic beauties of California. There are numerous articles on the fashions, and woman's work.

MC CLURE'S.

Perhaps the most timely article in *McClure's Magazine* for November, is A Woman's Diary of the Siege of Pekin, by Mrs. E. K. Lowry, one of the besieged missionaries in the legation last summer. Another article that will awaken general interest is that on The First Flight of Count Zeppelin's Air Ship, by Eugen Wolt, the Count's assistant and companion in the trial. Interesting, suggestive, helping—that must be the verdict upon Wm. Allen White's Character Sketch of Hanna. The fiction in this number is of the usual high standard. A Temperance Campaign, by G. K. Turner; Confusion of Goods, by Frederic Carrol Baldy; Charles Warren's story of How the Law Came to Jenkins Creek; Little Hallujah's Convert, by Alvah Milton Kerr, and The Love that Glorifies, by Lilian True Bryant. Ray Stannard Baker's account of The Making of a German Soldier is instructive and well written. The story of The Crucifixion of the Messiah in the Rev. John Watson's Life of The Master is a worthy continuation of a notable work.

ODDS AND ENDS.

ILLUSTRATION.

What a broad, open, ever widening field illustrations is for the artist. It reminds one of the vast tracts of uncultivated land in the West where only here and there fields are cultivated, with the rich untouched soil still to be tilled. Many are the papers and magazine illustrated, but only the margin of the great field of work has begun.

Many large publishing houses pay especial attention to reproduction and lithography, and employ regular artists to execute their work. While if anything of especial merit comes to them, or they are rushed with work, other outside illustratoors are engaged.

Multitudenous are the means and ways of illustrating. The gate way if entered by the ambitious amateur, must close it behind him, buckle on the methods that will best fit him for a long dusty up grade road, and travel it without much rest, and scant nourishment, until the goal of success is reached. Now and then he will be encouraged by a lift from some friend, tossed to him like dry crust—again he will have his dry lips moistened by a juicy plumb from some promise from a publisher (who never pays him) but he must grip his pen the harder, and his dusty staff with a firmer grasp, and climb on to the top where the air is pure and the landscape smiles beneath him, and the pines clap their hands over his successful performance.

The avenues are so varied, a young illustrator hesitates which to enter. He wastes much valuable time playing around the gateway. There is such jolly Bohemian company at the beginning of his journey. They all like to play croquet, tennis, golf and use the "lead" occasionally. He is enticed by their winning manner to join in their excursions, late suppers, and sketching tours, while more time is spent in reveling than picture making. He awakens from this dream with very little money but keener perception—with determination to seek one avenue in the field of illustrating, and follow that undeviatingly. Which shall it be? — the characterturist, where some enter but few have the talent to carry it to a successful issue. The political newspaper illustrator—whose field is full of thorns, but lucrative. The poster maker, where the sailing is smooth, subject to squalls, sudden death in a few years, but profitable while it lasts. The illustrator of books, which takes intelligence, fine sense of adaptability, keen insight for

vital points a great love of fiction, and a thorough knowledge of drawing in every field, still-life, figures, landscape, both picturesque and pastural, perspective and composition. Keen wit to adjust onesself to publishers' wants, and the author's desires—insight into the methods needed for best reproductive.

Or shall our embryo illustrator, submerge self and engage to furnish the papers with the "latest fashions" as a bread winner, until he has reached some plain in his career to choose an avenue and tread it to the end.

Shall he bend his energies to the field of advertizement which is ever alluring, but menial, a constant demand on time and thought but the widest field yet open to the illustrator.

Or shall he be a "specialist" and travel some new road, over which no one has ever passed, and make for himself a name as did Charles Dana Gibson, famous for his "American Girl," Edwin Abbey, noted for his Shakespereian character drawing a Pennell with his crisp bits of Europe; or a Remmington famed for his strong drawing of cowboys and mustangs.

After one decides the avenue to travel another tantilizing doubt stops him at the beginning—what medium is best to use for reproduction? Should he choose Wash drawing, Dry Point or Pen and Ink. It is universally acknowledged pen and ink drawings reproduce most satisfactorily. Wash drawings are best for some composition. Dry point for others. which ever field one enters make one medium subserve your purpose and persevere in that line until the best work is reproduced from it. Let the lights and shades be crisp and clear, simplify the method, use no extra lines. Tell the story direct, so that the eye can see at once what the mind wishes to unfold and you are on a fair way to success.

What an open field for women. One can mention on one hand those famous as book illustrators, As news paper designers, for posters, for calendars, for bookcovers charactertures; there is much room in the front rank.

Who cares now in this age, where the love of art is beginning to be felt in every home, to read a book, paper or magazine that is not illustrated. As the Turk said at the World's Fair, "I cannot read English papers, but I can read the pictures." It is a universal language.

Illustration brings to our very doors great works of art. Great masterpieces are made a familiar thing to the school children. Their minds are enlightened and kindled with a desire to see and know more.

We measure and estimate the style of a book or magazine by the style of its illustrations. If superior, we enjoy and glow with pleasure over a refined picture cleverly reproduced. While a coarse cut repulses us and we refuse to buy a magazine on account of its poor reproductions.

Which volume would you choose on entering a book store.

The plain pointed text of "The Absent-Minded Beggar by Rudyard Kipling. Or the handsome booklet with uncut edges, margin and chapter heads illuminated, the thought clearly defined by artistic illustrating.

Who would not rather see "Duke's son, Cook's son, son of a hundred kings. (Fifty thousand horse and foot going to table Bay" in a praphic picture, thrilling and pulsating with life, than in cold print.

Or who would care to read James Lane Allen's "The Reign of Law," without the beautiful interpretation by the facile pencil of Harry Fenn, who gives us glimpses of the flowering heads of the waving hemp fields. □ The cutting March winds and quiet sheep pastures—the swaying, elastic figures cutting the hemp.

Or the vision of Gabriella as the shadowy twilight played around her while mourning at the hemp brake.

Or the broad expanse of Kentucky landscape, "masses of living emerald, saturated with blazing sunlight."

The ideas of Mr. Allen so vividly wrought out, kindles the heart with adimiration for both author and artist alike, and makes one acknowledge illustrations is a unique field for the uniniatated to enter.

The Bull in a China Shop. If ever a man is tempted to regret his existance it is in the experience of masculine shopping — not the purchase of a lawn-mower or a load of hay, with which the descendant of the Lord's first-born is comfortably familiar, but the business to be transacted over the dry-goods counter and the awful presence of the "saleslady" chilling him to the core. I have a humorous friend—thatis, he fancies he is humorous —who endeavors to wring pleasure from these solemn rites, actually attempting badinage now and then. Lately he wished to purchase a pair of small gloves, adapted to his limited anatomy, and after some confusion sidled up to the "youth's counter," perfectly conscious of some impending danger. "Them's boy's gloves" suddenly broke upon the affrighted silence, as a languid damsel paring her nails looked upon him superciliously. "Well won't they do for an old boy," he feebly asked—whereat the animated phenomenon refulgent in kaleidoscopic raiment looked savage and turned away in withering dudgeon. My friend, in obedience to a principle never to encourage fatal deficiency of humor, sought another establishment. Here he found the ideal goddess of the counter, pretty as a picture, radiant with bonhomie and graciously attentive. "Will you give me your hand, please?" "Oh, this is really so sudden! (it happened to be leap-year) I must ask mamma." This woman was human, and the brief yet merry interview which followed amply atoned for

funereal experiences elsewhere.

The safest passport to success in ventures of a dubious nature in the "saleslady's" domain seems to be to allow the presiding divinity to enlighten the purchaser without hindrance as to the special article he desires, no matter what, the proper amount he should disburse, etc. etc. True, he might find that he had borne away the wrong trifle; yet the thought of a perfectly harmonious transaction would be exhilarating to the distressed predicament of man under circumstances so wholly foreign to his natural genius. Should Eliza Jane affect a chiding mood, her beaming spouse could persuasively descant upon the celerity and comfort of his exploit. If by accident he has added to the family stock of blue ribbon or clothes-wringers, having been commissioned to purchase cotton flannel and nutmegs, they will keep, keep, you know, and are sure to come into play, if not in this in some succeeding generation. There's nothing like proper recognition of the "saleslady's" omniscience and the calm of a mercantile accord.

Ocean Depths.

The abyss of waters lying beneath us as we cross the ocean is seldom realized. ccording to an authoratative statement by Sir John Murray, in an address before the British Association, it is known that considerably more than half of the sea floor lies at a depth of 2000 fathoms, or more than two geographical miles. The charts of the noted Challenger expedition record as "deeps" all areas exceeding 3000 fathoms, forty-two such being known, twenty-four in the Pacific, fifteen in the Atlantic, three in the Indian, and one in the Antarctic ocean, comprising about 7 per cent. of the entire water surface upon the globe. Of more than 250 soundings twenty-four exceeded 2000 fathoms, three being upwards of 5000 fathoms. Eight of these deeps show more than 4000 fathoms, or four geographical miles. Depths exceeding 5000 fathoms have been found in the south Pacific, eastward of the Friendly islands, the greatest depth being 5,155 fathoms, or 530 feet more than five geographical miles. This enormous depth of ocean is illustrated by the fact that it is 2000 feet more below the level of the sea than the summit of Mount Everest, in the Himalayas, is above it. Not an exhilarating thought for the Pacific missionary on his way to enlighten, or to be enlightened by, the heathen. Yet even profounder depths than this may be revealed by future explorations.

Cock-A Doodle-Doo!

Whatever be their shortcomings, Americans, in the opinion of thoughtful travellers, are gifted with one supreme virtue—amiability of temper. Seldom indeed is the native wrath or peevishness excited and in his most excited moments the American, of all men, is amenable to the mollifying influence of a bit of badinage which in an instant transforms his "dander"

into smiles and laughter. His normal mood is essentially gentle, and, if his manners be not always well-bred, his innate bonhomie spares him the reproach of enduring anger.

Contrast with this native good humor the consuming, often malevolent, passions of the Latin races, the Teuton's splenetic scorn, the Briton's contemptous assurance—all of which have an atrabilious tinge wholly foreign to our character. Even the utmost access of our rage melts away beneath the exercise of a little tact—it is not in us to brood, to plot revengful evil, or prolong an attitude of enmity. Our contemplation of mankind is from the standpoint of peace and good will. Our love of fellowmen is active, as it is earnest and sincere.

Upon alighting from a railway carriage, the story goes, an Englishman was accosted by a fellow-traveller: "Say, stranger, I guess you've forgotten your umbrella have'nt yer?" to which the Briton replies: "Why, I didn't know you were an American." "How could yer tell?" "Because you're so d—kind." Reversing the situation, would the typical Briton have been so complaisant—and without an introduction? We doubt it.

We may justly pride ourselves upon this crowning grace of frankheartedness, this imperturbable sweetness of disposition which, if it be a diamond in the rough, is still a diamond. The pitiless raillery to which the slightest symptom of temper in our public men is subjected attests the prevalence and worth of this national characteristic, an even temper. "It makes me so mad," is but a puerile colloquialism—like the story of the empty box, there is nothing in it.

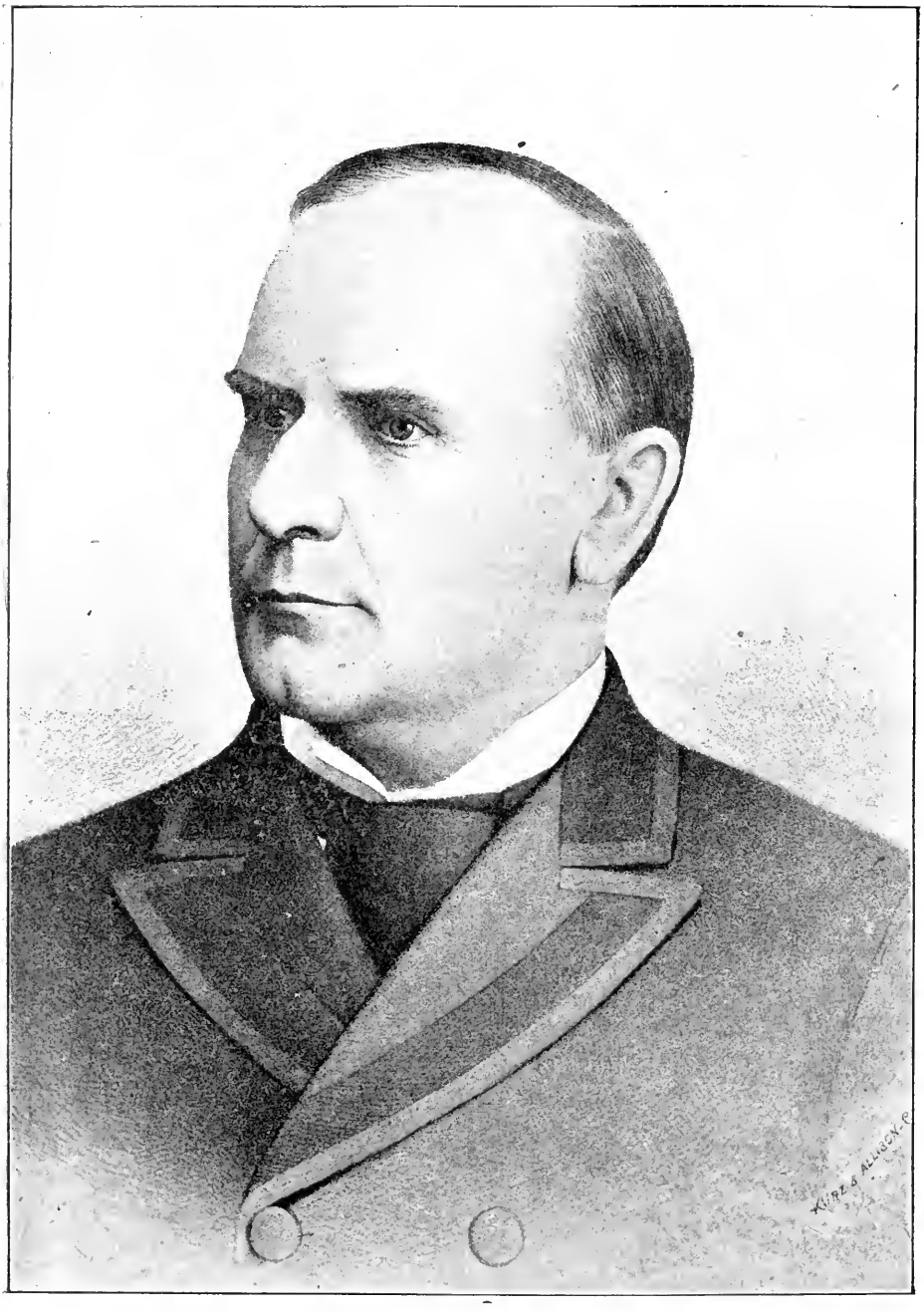
The National Irrigation Congress which will meet at Chicago, Ill., Nov. 21, 22, 23 and 24, is creating wide interest and promises to be an unusual success. The national irrigation movement has become a broad popular movement, and eastern commercial interests have readily taken hold of the idea of reclaiming and populating the arid west and thus creating a great home market for their goods.

The best authorities on irrigation and forestry have been secured to speak and give illustrated lectures, and men of national fame and renown as orators and statesmen, will address the Congress at the great Auditorium theatre on subjects of national interest to the West.

Under the constitution of the Congress the mayor of each city of 25,000 or less population is entitled to appoint two delegates, while cities of greater population are entitled to four delegates. Each agricultural college, organized irrigation, agricultural and horticultural association, each society of engineers, irrigation company and each board of trade and chamber of commerce is also entitled to two delegates.

Reduced railway rates have been arranged of one fare plus two dollars for the round trip to Chicago from nearly all western points, good until November 28th. All delegates or persons receiving invitations to the Congress can obtain this rate on the certificate plan. That is, travelers should buy a single trip ticket to Chicago and take a certificate (not a receipt) from the ticket seller at the point of starting. This certificate will be stamped at the Central Music Hall, Chicago, where the sessions of the National Irrigation Congress will be held, and will then entitle the holder, upon presentation to the ticket agent at Chicago, to a return ticket for only two dollars.

This liberal reduction will enable a great many people to take the trip to Chicago at a moderate cost.



PRESIDENT McKINLEY.

THE IRRIGATION AGE.

VOL. XV. CHICAGO, DECEMBER, 1900. NO. 3

THE PROGRESS OF WESTERN AMERICA.

West Should Stand Together

There is great need that everyone interested in seeing the Government take hold of the question of the reclamation of its arid lands should stand together at this session of Congress, and be ready to do whatever possible to secure concerted action.

The great prominence given to the meetings of the National Irrigation Congress at Chicago, and other influences, have shown to thoughtful members of both houses of Congress that this irrigation question is something that has to be settled with, and that there is no use in trying to think it can be indefinitely put off. The question with them is how to do it. Eastern statesmen are asking this question now.

Reservoir Construction

It is possible that some definite plan of action will be put forward this winter to secure reservoir construction. If so, every man in the West should wake to the opportunity. The favorable action of Congress on the question of building some particular reservoir would be the beginning of a general policy of reclaimation of the deserts. It would be an entering wedge. It is a matter of the most tremendous interest to the West and to every interest in the West.

This point should not be overlooked; that whatever reservoir site it is proposed to concentrate the attention of Congress upon, and in whatever State or locality, every other State and Territory should bend every effort to secure the construction of this first reservoir. This would start the movement.

Take Up The Fight

In the meantime every newspaper in the arid belt should take up the fight from now on and urge upon the people of the West the great opportunity which is now before them. Congress is now ready apparently to listen to some fair proposition which does not resemble a raid; but the West should back up the demands of its representatives in Washington by a united and persistent demand that the time has come for some Governmental action.

There are enough Western Senators and Congressmen to carry the Federal irrigation proposition to a triumphant issue, if they will stand together, and every man of the West should sit down and write a personal letter to his member of Congress and to his Senator at Washington, and tell them why they should work to get a bill passed providing for the construction of reservoirs by the Government to store the floods.

You are Interested.

No man, no locality is uninterested in this plan. Every industry of the West would be stimulated and developed wonderfully through the carrying out of a policy which would reclaim 75 million acres of arid land.

If the people of the great West ever were interested in anything, they are in-

terested now in seeing that this question of national irrigation is pushed forward and pushed forward strongly within the next two months.

The Forestry Question.

The motto stretched above the platform of the National Irrigation Congress while in session at Central Music Hall read: "Save the forests and store the floods," The storing of flood waters in vast reservoirs, with the two-fold purpose of obviating destructive torrents and of feeding out the reserved waters later for irrigation purposes, was the subject which naturally engaged the attention of the congress almost exclusively in its earlier years. But more recently and particularly at this annnal convention, the subject of perpetuating forests where they now exist, and of afforesting denuded areas. has come to be looked on as an important item in the general subject of irrigation.

This importance is due chiefly to two facts, the first of which is that timber, or even a scrub growth, protects the snow fall from the sun and so from disappearing in a destructive flood. The second fact is that forests protect mountain sides from erosion and reservoirs from being filled up with the detritus. These two points were emphasized at the meeting of the congress held at the Auditorium, both in the extended letter from Governor Roosevelt and in that from General Miles.

A considerable and growing number of persons are curious to know what the United States is doing and to know what more ought to be done to protect and increase cur forest areas. It is not to be questioned that people in general are becoming more and more concerned about forests, not alone in respect to the lumber supply, but with respect to water supply and national scenery. They should be given more information at the next convention than they received this year.

Always Growing.

At the annual International Shoe and Leather Fair, recently held in London, the American exhibits were so good and numerous that the English called it "a huge Yankee Show."

John T. Day, editor of the London Shoe and Leather Record, is quoted as saying in a published interview:

"Our dependence on American ideas and raw material may be gauged by the fact that 90 per cent. of the machinery in British factories comes from the United States. Seventy-five per cent. of the leather we consume is imported from American tanneries. Even thus equipped we seem powerless to repel the invasion of American made shoes.

In 1898 $370,000 worth of American shoes were sold in the United Kingdom. In 1899 the amount increased to $715,000. This year I suppose our purchases will approximate $2,000,000. Superior workmanship, combined with prices home manufactures cannot meet, have given American competitors a winning advantage. They have already captured the Australian trade. They are beginning to take our European customers away from us.

Even in our new African dominions they have begun to press us. It is the same old story—American enterprise and British lethargy. This fair ought to prove an eye-opener for British manufacturers."

NATION AS ARID LAND RECLAIMER.

At the National Irrigation Congress lately held in Chicago, two hundred delegates were present, and their motto was: "Save the Forests, Store the Floods, Reclaim the Deserts, and Annex Arid America."

President Mead in his opening address told of the inception of the movement and recounted the questions now facing it. In speaking of the need of national legislation he said:

"While no question has yet arisen of greater importance than the necessity of securing such changes as will unite land and water under one control, other questions besides ceding the public lands to the states have finally relegated this to a subordinate position. It is now realized that watering these deserts is not solely a problem for the states, that the nation has certain duties and responsibilities, and that there are certain questions which require national legislation and oversight.

"The need of national laws grows out of the fact that in the West it is water and not land which is of overshadowing importance. Many western rivers are interstate streams. The laws of the states through which they flow differ widely in character, while in some they are both inadequate and dangerous. The appropriation of these interstate rivers under these lax and conflicting state laws threatens to become a fruitful source of litigation and social disturbance, unless in some way the conflicting rights and warring policies can be reconciled and adjusted."

National govermental control of the water supplies in the arid and subarid lands of the West was strongly advocated. General Nelson A. Miles, Governor Roosevelt, and former Senator Dubois of Idaho emphasized this idea, the two former by letter, and the latter in an informal speech.

"The government of our country has an important mission to perform," said General Miles in his letter to the congress. "Now that it has taken hold of the work it is presumed that it will continue until a time when the entire irrigation system will be under control, with one simple law governing it alike in all the western states and territories. Extravagance in expenditure should be avoided, and the government should systematically improve only such lands which will repay the expenditure, and divide the same in such manner that they can never be monopolized by a few, but shall be cultivated by an industrious, enterprising and intelligent people, who will build for themselves and

their posterity homes that will enrich and beautify the region, thus sustaining and promoting the general welfare."

Governor Roosevelt outlined a plan for government supervision, which he summed up in the following points, which he said must be attained:

Government study of the streams upon which the plans depend.

Government construction and control of great irrigating plants.

The preservation of forests by the extension of the forest reserve system and government control of the forests.

National protection and use of the forests under expert supervision.

The instruction of private owners of forests, East and West, that timber can be cut without forest destruction, and that ownership of water rights in the arid country and of forest lands anywhere entails public as well as private duties and responsibilities.

Mr. Dubois expressed hope that the water supply of western lands would never fall into the hands of corporations.

Professor Willis L. Moore, chief of the United States Weather Bureau, told of the achievements of the weather bureau in relation to irrigation problems. He said the department had been able to forcast far in advance of the season the probable character of the water supply on the plains. This is done by measuring the snowfall in the mountains, where the packing of snow and ice in ravines forms great natural reservoirs.

Gifford Pinchot, forester of the United States Department of Agriculture, in an illustrated lecture on "Forestry is Business," pointed out the many economic reasons for the preservation of the forests. The department, he said, is accomplishing great results in the West by showing timber owners how they can cut this timber and yet preserve the forests. Destruction of the forests, he said, will mean more floods.

H. B. Maxson, the secretary of the congress, reported that the National Irrigation Association now has 1,000 members, representing the leading agricultural, commercial and labor organizations. The reclaimation of the arid lands of the West would provide homes for 100,000,000 people, he said.

Captain Hiram M. Chittenden, of the United States Engineer Corps, said that the building of great storage reservoirs at the head waters of the western rivers would not only impound water for the irrigation of millions of acres of arid land, but would prevent the floods of the lower rivers. This work, he said, came properly under the general government.

George H. Maxwell, chairman of the executive committee of the congress, declared that too many men are fighting for water instead of getting together and starting a campaign for government action

"Get to work and see if we cannot get one great 'object lesson' reservoir built by the government," he said.

Thomas Knight, of Kansas City, contended that the reclaimation of the arid lands of the West could not be detrimental to the interest of the farmers of the East.

Herbert Myrick, editor of the *American Agriculturist*, declared that the reclamation of arid lands would create a large field for the development of the sugar beet industry, saying: "The arid regions are free from droughts or unusual rainfall, which are alike injurious to beets."

Hugh M. Wiley, chemist of the Department of Agriculture, also declared the sugar beet was well adapted for growth on irrigated soil.

Henry James, editor of the *Forester*, declared the preservation of the forests would prevent an exhaustion of the water supply.

By a unanimous vote Thomas F. Walsh, the mine owner and former United States Commissioner to the Paris exposition, was elected president. Mr. Walsh resides in Washington. J. Bradford Prince, of New Mexico, was elected first vice-president, and F. B. Thurber, of New York, was selected for second vice president. H. B. Maxson was re-elected secretary.

Mr. Walsh said that upon the proper development of irrigation depended the future prosperity of the West and to a large extent the welfare of the whole nation.

"Above all is to be emphasized the fact," he said, "that in the West are opportunities for making thousands of homes, where men can earn their living from the soil and be practically independent of hard times. The safety of our institutions rests, to a large extent, upon the ownership of small farms by the men who live upon them and derive their support from the products of the soil. In all the great centers of population, like New York and Chicago, are thousands of unemployed men, constant sources of Danger. There is no higher duty for the citizens of the country at large than to make it possible for these unemployed men, who are willing to work, to make for themselves homes upon the national domain."

John W. Ela, of Chicago, spoke on "A Forecast of the Future." He said in part: "The more small farmers we have in this country the more prosperous the country will become. We are particularly fortunate in that we have a large area of land which will some day become the homes of the small farmers. There is such an expanse of territory that it will prevent syndicates from owning and controlling it, and when reduced to cultivation with the assistance of irrigation it will become the homes of the small farmer."

A. C. Bartlett read a paper written by Dwight B. Heard, of Arizona, on "Government Irrigating Works in India and Egypt," and

C. B. Booth read a paper prepared by Harrison Gray Otis of Los Angeles, Cal., on the "Reclaimation of Arid America." Frederick H. Newell, hydrographer of the United States Geological Survey, in an illustrated lecture told of "Our National Irrigation Resources."

J. B. Whittemore explained the primitive irrigation of the Pima Indians in Arizona, and Milton Whitney, of the United States Department of Agriculture, spoke on "Alkali and Its Remedies." Alexander H. Revell delivered an address on "The Grandest Opportunity in the Pathway of Nations."

PRACTICAL IRRIGATION.

Although the general subject of irrigation and the reclaimation of arid lands is discussed widely, and has come to be one of the great questions before the people of this country, yet there is probably a considerable number of persons who have a very vague idea as to the methods by which the water is brought to the land. A few elementary statements may, therefore, not be out of place.

As a fundamental proposition, it may be said that irrigation on any considerable scale is possible only by means of gravity systems and open ditches. In other words, the amount of water required is so great that it will not pay to bring it to the agricultural lands unless it can flow through ditches or channels dug into the surface of the ground. In exceptional instances pumping has been employed, and the water conveyed through pipes, as is customary in municipal supplies.

In order to irrigate land, it is necessary to dig a ditch leading from a stream whose slope is so great that the ditch, following its bank on a lesser grade, can gradually be diverted from the river. If, for example, the stream falls at the rate of 10 feet per mile and the ditch only one foot, it is evident that the water in the ditch only one foot, it is evident that the water in the ditch will be 9 feet above that in the river at the end of the first mile, and in 10 miles will be 90 feet above the river, and usually, looking down over a large extent of bottom land. If now allowed to escape from the ditch, it will find its way back to the river across the intervening low lands. Successful irrigation consists in guiding this water in its journey back to the river in such a way that it will cover the largest area of land, saturating it to the proper degree.

The methods by which the water is thus conducted are numerous, the water in the supply ditch, following the contour of the land, is allowed to escape in temporary ditches, and from these it is turned out and guided by a shovel, so that it flows outwardly along the slope of the land and finds its way by innumerable tiny rivulets down the slope. Considerable skill is required to distribute the water uniformly in this so-called "wild flooding," and as a rule the lower parts of the field receive an excess of water while the higher portions are left dry.

The supply ditch follows the general contour, dropping slightly; below this the land is divided into rectangular fields, each of a size such that by means of a low ridge—say 2 feet in height—the water can be held back and flooded over the entire surface. If the slopes are steep these checks or little leeves must be near together, while if

the land is nearly level, they can be far apart. Water is turned into each of these compartments, which may contain from 1 to 20 acres or more, and the stream from the ditch is allowed to flow until the entire compartment is flooded. A small gate is then opened, or the check cut with a shovel and the water drained off until the next compartment is full, and so on until the entire area has been thoroughly wet.

In the case of crops cultivated in furrows, such as potatoes, it is customary to run water down the furrows —these being laid out so that the water will flow freely, yet without washing the soil. In practice, the water flows down four or five of these furrows at once until it reaches tne lower end, and then it is shut off and turned into another series of furrows.—*Buffalo Voice.*

"SAVE THE FORESTS AND STORE THE FLOODS."

The holding of the National Irrigation Congress in the East, as it turned out, was a wise move. The people of that half of the country have had the subject of national irrigation brought home to them in a manner not otherwise possible. The far-reaching importance of the problem has been presented to them and a genuine interest has been awakened. Instead of finding opposition in the East, the Congress found that eastern men of prominence were more than interested in a proposition which promised an increased western population of millions of people.

As the "enemy's country" has been invaded, the myth of eastern opposition has faded away and its people are found to be anxious to see inaugurated a national policy of western arid land reclamation.

The western delegates went home with the feeling that they have the hearty support of eastern interests in securing action which will open to settlement a half a continent, capable of supporting fifty million people. They cannot but feel that this support is growing; that it is developing into a great movement; that many people are realizing that national action would meet such a western development as would increase the national wealth beyond measure.

The time seems fully ripe for the west to take a firm and decided stand on the question of national irrigation and something great may be accomplished at once. Why not? It is as right that Congress should appropriate money for storage reservoirs as for river and harbor improvements. The building of storage reservoirs would obviate the necessity for much river expenditure and would help navigation, and the home building area of the United States would be vastly increased. And now if the West makes this demand the East will back it up, for the benefit would not be local.

Every western paper is interested in seeing this development accomplished. What would be the result of an appropriation of eight or ten million dollars spent annually in the west for irrigation construction? The immediate stimulation would be enormous and the future benefit greater. This policy should be inaugurated and the western press should urge it with one voice. It is a national matter; it can be productive only of great good; the East is responsive; will the West be aggressive; it is time to work.

It is the opinion at Washington that $40,000,000 will be appropriated by this congress for river and harbor improvements. Of this the

western half of the United States will get, judging by previous records a couple of million or so. Whatever are her possibilities, it is not contended that the West is as important or influential as the East. She has not yet the dense population; but why should she not get at least a fair share of this great appropriation? Why should she not get a fourth of it, to be applied to the building of great storage reservoirs to be filled with flood waters for use in irrigation, under a system of internal improvements?

The government is spending large sums in aiding in the development of foreign trade and the opening of foreign markets for American manufacturers. It is believed that we should push our goods into every market of the world and sell them. The belief is also gaining ground that the government should also develop its home market for American products and manufacturers. This it could do by reclaiming the 75,000,000 acres of western arid land and settling them with thousands of industrious home builders. Eastern merchants are more than willing to see such an undertaking. The west should take the initiative.

The telegram sent by the National Irrigation Congress at Chicago, urging upon President McKinley the importance of the irrigation and forestry problem and requesting him to in turn urge upon Congress the advisability of some definite action, has done more to direct public attention to these important national questions than any other one.

To the President:

The ninth annual session of the National Irrigation Congress now in session in the City of Chicago, respectfully urges that in your message to Congress you call attention to the national importance of the preservation of our forests and of the extention and conservative use of the forest preserves, and further that you emphasize the need of national action to store the flood waters that now go to waste.

"Save the Forests and Store the Floods" proved a popular motto at the Chicago Irrigation Congress. Its sessions bore a marked atmosphere of thoughtful consideration of how these great objects could be accomplished and a general spirit of harmony and co-operation pervaded the atmosphere. Much satisfaction was expressed at the growth of the national irrigation sentiment in the East and the interest and active co-operation afforded by eastern business men.

Great as is Chicago, with her people equaling in numbers a third of the entire population of the western half of the United States, yet the National Irrigation Congress was recognized as the exponent of a national movement, and caused no little local and general comment. Chicago newspapers devoted their columns to its meetings and Chicago's largest business men attended them. The great problem of the reclamation of the millions of arid acres was recognized at its true

value and the incalculable benefits to result, appreciated. The national irrigation question is an assured fact.

The following resolutions were adopted by the National Irrigation Congress, November 24, 1900:

"We hail with satisfaction the fact that both of the great political parties of the nation in the last campaign declared in favor of the reclamation of arid America, in order that settlers might build homes on the public domain, and to that end we urge upon Congress that national appropriations commensurate with the magnitude of the problem should be made for the preservation of the forests and the reforestation of denuded areas as natural storage reservoirs and for the construction by the National Government as part of its policy of internal improvement of storage reservoirs and other works for flood protection and to save for use in aid of navigation and irrigation the waters which now run to waste and for the development of artesian and subterranean sources of water supply.

"The waters of all streams should forever remain subject to public control and the right of the use of water for irrigation should inhere in the land irrigated, and beneficial use be the basis of measure and the limit of the right.

"The work of building the reservoirs necessary to store the floods should be done directly by the government under existing statutes relating to the employment of labor and hours of work and under laws that will give to all American citizens a free and equal opportunity to get first employment, and then a home on the land.

"We commend the efficient work of the various bureaus of the national government in the investigation of the physical and legal problems and other conditions relating to irrigation and in promoting the adoption of more effectine laws, customs and methods of irrigated agriculture, and urge upon Congress the necessity of providing liberal appropriations for this important work.

EXTRACT FROM REPORT OF SECRETARY OF AGRICULTURE.

Much progress has been made during the past year in the organization and development of the irrigation investigations conducted through the Office of Experiment Stations.

In accordance with the terms of the appropriation act, two general lines of investigation have have been pursued: (1) The study of the laws and institutions relating to irrigation in different regions and (2) the determination of the actual use made of irrigation waters.

The largest single enterprise connected with these investigations has been in the State of California. The growing value and increasing scarcity of water in that state are creating imperative need of better laws to control the distribution of streams, and there is much public interest in this subject. This local interest has been shown in a most substantial and gratifying form by the co-operation of the California Water and Forest Association in our work and the contribution of several thousand dollars to be expended under the direction of the agents of the Department. The University of California and Leland Stanford University have also given efficient aid to this enterprise, and have been represented on the staff of agents employed in the prosecution of the work.

Eight typical streams in different parts of the state have been thoroughly studied with reference to the conditions under which the water for irrigation is owned, distributed, and used. A comprehensive report on these investigations is now in course of preparation. It is believed that this is the largest and most comprehensive inquiry regarding irrigation laws, customs, and conditions which has been undertaken in this country. Similar investigations, though on a smaller scale, have been made in Utah, Colorado, and other States.

The measurements of the duty of water undertaken last year have been extended this season, regular stations for this purpose having been maintained in eleven States and Territories in the irrigated region. A detailed report on the observations of the previous season is now in press, which includes a larger amount of data on this subject than has ever been brought together before. Studies of the losses from evaporation and seepage and of the amount and character of sediment contained in irrigation waters have also been carried on in a number of localities.

Interest in the use of irrigation to supplement rainfall in the humid regions of the United States is constantly growing. In a number of sections this has been greatly stimulated during the past season by long-continued drought. Interesting and valuable investigations regarding the use of water for irrigation in New Jersey have been made by Professor Voorhees, director of the New Jersey agricultural experiment stations. The results of these investigations have recently been published, and they indicate that the practice of irrigation has been quite profitable in that state as far as it has been tried.

Similar investigations are being undertaken in Missouri and Wisconsin in co-operation with the experiment stations in those States. A preliminary survey was also made of the conditions of irrigation practice in the rice fields and sugar plantations of the Southern States. This indicated that there is great opportunity for improvement in the methods and use of water in that region, and it is hoped that it may be possible to undertake a study of some of these problems in the near future.

A report on the irrigation system of Hawaii is now in press. A popular bulletin on the practice of irrigation in connection with horticulture has been issued and widely distributed.

Although the irrigation investigations now in charge of this Department have been in progress too short a time to permit the publication of extended reports, it is believed that they have already had important results. As the basis for these investigations, an effort has been made to ascertain the actual needs of the people of the irrigated region as regards the investigation of irrigation problems. This has led to widespread discussion of this subject in agricultural and other associations, as well as in the public press. Through the publications of this Department already issued and the addresses of our agents in public meetings in different parts of the irrigated region, the existing conditions have been described as accurately as a preliminary survey would permit. The lines along which investigations must proceed have also definitely been pointed out. In this way the experience already obtained by the experiment stations, State engineers, and officers and experts in irrigation matters has been brought to bear on the public mind more effectively than heretofore. The result has been a great quickening of interest in this matter throughout the West, together with a large and more definite realization of the importance of the development of our irrigation system and the intricate nature of the problems involved. A great desire has been awakened to have an accurate and complete showing of facts, on which permanent improvement alone can be based. This has led to hearty co-operation of the people and local

authorities in our investigations wherever they have been undertaken and demands for our work far beyond our ability to meet.

While the earnestness with which these demands are pressed is very largely due to the urgent needs of localities and individual farmers and ditch owners for the remedying of evils affecting their immediate interests, it is also beginning to be seen quite clearly that the questions involved in this and kindred investigation have a direct bearing on the problems which are of national and even international importance. On the supply of water for irrigation and its equitable distribution depends the permanent existence of civilized life in one-third the area covered by the forty-eight States and Territories of the Union. Questions relating to irrigation are vital not only to agricultural, but also to all other interests of this vast region, and the ultimate solution of the problems relating to irrigation will be found not only in State legislation and administration, but also in the action of the National Government. Most of the streams used for irrigation cross State lines, and some of them run partly in foreign countries.

The nation still owns large areas, the development of which will necessarily depend on national land laws recognizing the importance of extending the irrigated region as far as possible. Sooner or later these questions must be taken up by the United States as well as by the individual States and settled on a just basis and in accordance with actual conditions. What is needed in this matter at the present time above everything else is the impartial ascertaining and recording of the facts relating to irrigation in this country. It is this task which this Department has set for itself. It is believed that an efficient organization for the prosecution of this work has been established and that in this way a basis has been laid for the prosecution and extension of the work as rapidly as the necessary conditions of the investigations and the available funds will permit.

In view of the urgent need for the extension of these investigations, I recommend that the appropriation for the ensuing fiscal year be increased from $50,000 to $75,000.

WASHINGTON LETTER.

A statistical abstract of the world which will show the imports and exports of every country in the world having statistical reports is the ambition of the Bureau of Statistics of the Treasury Department. To present in a single volume a picture of the world's commerce not only of to-day but extending back over a long term of years, and to show that commerce in detail as to principal articles, country by country with quantities and values stated in United States currency and measures of quantity, is a work of no small magnitude, but of such great importance to the commercial interests of the country that it is being resolutely undertaken by the Bureau of Statistics. The details of this work, which will be carried on under the personal supervision of the Chief of the Bureau, have been entrusted to Mr. Benjamin T. Welch, whose long service in the Bureau especially fits him for this duty.

The opening chapter of the proposed volume has already been completed. It shows the total imports and exports of each country of the world having statistical records, from the earliest date for which the figures are attainable down to the present time. In the case of the United Kingdom the report begins with the year 1800, and shows the total imports, total exports, and excess of imports or exports in each year from that date to the present time. In the case of Austria-Hungary the record begins with the year 1800; Belgium, 1831; France, 1831; Germany, 1872; Italy, 1861; Netherlands, 1860; Russia, 1861; Spain, 1860; Norway, 1860; Sweden, 1860; Canada, 1851; Mexico, 1873; Argentina, 1870; Chile, 1860; China, 1868; Japan, 1874; India, 1851; Australia, 1851; Egypt, 1874; and Cape of Good Hope and Natal 1851. in each case the figures covering the entire period from the earliest date named to the present time. The subsequent chapters will give the details of the commerce of each of these countries, the principal articles imported and exported during a term of years down to the latest attainable date, and the principal countries from which its exports are obtained and to which its exports are distributed.

The figures on the total commerce country by country, which have already been completed, afford material for some interesting comparisons with our own growth meantime. The imports for home consumption of the United Kingdom, for instance, which in the year 1800 amounted to $81,310,000, amounted in 1899 to $2,043,896,450, an increase of 2400 per cent.; while in the case of the United States the imports for home consumption in 1800 were $52,121,891; and in 1899, 5,441,892, an increase of 1215 per cent. Taking the export side the

contrast is much more clearly in favor of the United States. The export of articles of home production from the United Kingdom in 1800 were $111,107,000, and in 1899 $1,287,151,345, an increase of 1059 per cent; in the case of the United States, the export of home products in 1800 were $31,840,903, and in 1899, $1,203,931,222, an increase of 3681 per cent.

In the case of France the comparison is equally interesting. The imports for consumption into France in 1831 were $72,182,000, and in 1899, $872,032,000, an increase of 1108 per cent.; while the export of articles of home production were in 1831 $88,088,000, and in 1899, $801,452,000, an increase of 810 per cent. In the case of the United States the imports for home consumption in 1831 were $82,008,110, and in 1899, $685,441,889, an increase of 734 per cent., and the export of articles of home production were in 1831, $59,218,583, and in 1899, $1,203,931,222, an increase of 1933 per cent.

The official data covering the commerce of the German Empire in its present form begins with the year 1872, in which year the imports for home consumption were $793,726,000, and in 1899, $1,304,977,000, an increase during that period of 64 per cent. The export of home products were, in 1872, $564,165,000 and in 1899, $801,452,000 an increase of 42 per cent. A comparison of the figures of the commerce of the U. S. covering the same period shows the imports for home consumption in 1872 to be $560,419,034, and in 1899, $685,441,892, an increase of 24 per cent., and the export of home products in 1872, $428,487,131, and in 1899, $1,203,931,222, an increase of 181 per cent.

One especially interesting fact developed by a study of these figures is that in the case of the United States they show with much greater frequency than in any other countries a favorable "balance of trade," or excess of exports over imports. In the United Kingdom, Germany, France, Belgium, Italy, Netherlands, Sweden and Norway, and practically all European countries excepting Russia, Austria-Hungary and Spain, the imports exceed the exports, in some cases by large sums, and this is true also of China and Japan. In the newer and great producing countries, Canada, Mexico, Argentina, Australia and India, the exports exceed the imports in nearly every case, though in sums which are insignificant when compared with the enormous balance of trade in favor of the United States in recent years.

The commerce of 47 countries other than the United States is pictured in the opening tables of the proposed volume. Of this number, 18 countries show an excess of exports over imports, and 29 show an excess of imports over exports. The principal countries which show an excess of exports over imports are Canada, Mexico, Argentina, Chile, Australasia, India, Egypt, Spain, Austria-Hungary, and Russia. A study of the detailed figures in this group of favored countries

whose exports exceed their imports, and a comparison of their exports with that of the United States alone furnishes a striking evidence of the phenomenal prosperity of our own conntry. No one of the 18 countries whose exports exceed imports shows a favorable balance of trade approaching that enjoyed by the United States, and a compilation of the excess of exports in the entire group of 18 conntries having such excess gives a grand total of only $414,845,000, in the latest attainable year, as against an excess of $544,542,131 in favor of the United States alone in the fiscal year 1900.

A good deal of anxiety seems to have been wasted with reference to the trade relations between the United States and Germany. It will be remembered that a fear was expressed some months ago that certain trade restrictions proposed in Germany might seriously interrupt the commercial relations between that country and the United States and especially decrease our exports to that country in agricultural products. Figures just issued by the Treasury Bureau of Statistics show that our exports to Germany, in the ten months ending with October, 1900, were $27,000,000 greater than those in the corresponding months of last year, an increase of about 20 per cent. and that our imports from Germany show an increase of $8,000,000, a gain of over 10 per cent. Of the forty great articles which compose the bulk of our exports to Germany more than two-thirds show an increase in 1900 as compared with 1899. Those which show the principal decrease are hog products, corn, wheat, fertilizers and certain lines of machinery. Those which show an increase are cotton, flour, fruits, tobacco, timber, mineral oils, cotton seed oil, oilcake and meal, tallow, parrafin, rosin, turpentine, coal, copper, builders' hardware, scientific and electrical instruments, agricultural implements, sewing machines, cars and furniture.

Copper shows an increase of more than $3,000,000, mineral oils $2.000,000, tobacco and agricultural implements nearly $1,000,000 each, and unmanufactured cotton over $28,000,000, while in the list of articles which show a decrease there are but two cases in which the falling off is as much as $1,000,000—corn showing a reduction of a little more than $1,000,000 and wheat a little more than $2,000,000.

American trade with China shows a more rapid growth than that of any of the European countries. The official reports of the Chinese Government for 1899, the details of which have just reached the Treasury Bureau of Statistics, show that the imports into China from the United States in that year amounted to 22,288,745 Haikwan taels (Haikwan tael–72 cts.), against 17,163,312 taels in 1898, 12,440,302 in 1897, 11,923,853 in 1896, and 5,093,182 taels in 1895. Thus in the four years from 1895 to 1899 the imports into China from Great Britain in-

creased from 33,960,050 haikwan taels in 1895 to 40,161,115 in 1899, and from the continent of Europe (Russia excepted), they increased from 7,552,099 Haikwan taels in 1895 to 10,172,398 in 1899. Thus, while the imports from Great Britain show an increase of 18 per cent. from 1895 to 1899, and those from Europe show an increase of 35 per cent., those from the United States show an increase of 337 per cent. Taking the imports from all parts of the world, the figures for 1895 show a total of 171,696,715 Haikwan taels and in 1899, 264,748,456, or an increase in the entire importation of 54 per cent. against an increase of 337 per cent. in the imports from the United States.

Reporting upon the foreign trade of Shanghai, the Commissioner of Customs at that port says: "The import trade in piece goods during the year showed great vitality. Almost every item of importance show improvement, the most remarkable being found in white shirtings, sheetings of all descriptions, chintzes and twills, handkerchiefs, towels and cotton flannel. Notwithstanding the continued increase in the consumption of American domestics, English goods have managed to show satisfactory progress. There are several makes, notably prints and dyed fancy fabrics, which are not interfered with by American competition as yet; and although they must be looked upon more as luxuries than as actual necessities, the trade in them is growing in importance and value."

The Commissioner of Customs at Canton reports as follows: "The value of our foreign imports exceeded that for 1898 by nearly two million taels, being 13,861,995 Haikwan taels. With the exception of cotton yarn, nearly all the staple articles, such as Manchester goods, kerosene oil and American flour advanced considerably."

Commenting upon the growth in the import trade at Tientsin, which showed a gain of 6,700,000 taels over 1898, the commissioner at that point says: "The conspicuous gains are in white shirtings, and more especially in American sheetings; this last article having gained 90,000 pieces over the record of 1898. American drills have declined 17 per cent. below the import quantity of 1898, although as regards value they show a gain of 6 per cent. American kerosene oil has fallen off greatly, the import (1,868,000 gallons) being only half that of 1898. Machinery, railway materials, munitions of war and government stores all show an increase over the figures for 1897 and 1898."

Imports into the United States from Porto Rico have trebled, and exports to that island from the United States have quadrupled in the five months since the enactment of the new Porto Rican tariff act, as compared with those of the corresponding months of 1896 and 1897 when Porto Rico was under the Spanish flag. The Porto Rican tariff act went into effect May 1, 1900. The imports from the island in the

five months whose record the Treasury Bureau of Statistics has just completed, amount to $3,316,334, against $1,169,128 in the corresponding months of 1897, or practically three times as much in the five months of 1900 as in the corresponding five months of 1897. The exports to the island in the five months of 1900 are $2,807,909, against $717,744 in the corresponding months of 1896 and $768,802 in the corresponding months of 1897, or practically four times as much in 1900 as in 1896 or 1897.

These figures are especially interesting because of the fact that it was supposed when the act went into effect, that the commerce of the first year would be very small by reason of the hurricane of last year which proved so damaging to the chief industries that it was thought the island would in the present year have little to sell and consequently little with which to buy. Yet the figures given below show that it has sent to the United States in the five months from May 1, 1900, to October 1, 1900, twice as much in value as in the corresponding months of 1899 and three times as much as in the same months of 1897, and that it has bought from the United States more than twice as much as in the corresponding months of 1899 and practically four times as much as in the corresponding months of 1896 or 1897.

The table which follows shows the imports from, and exports to Porto Rico in its commerce with the United States during May, June, July, August and September of 1896, 1897, 1899 and 1900, respectively, and the total for each period, and thus enables a comparison by months and by the entire period both with 1899, when the island was under the American flag but subject to the general customs laws of the United States, and with 1896 and 1897, when it was Spanish territory. It will be seen that every month since the enactment of the new law shows a marked increase over 1899 and a still greater increase as compared with 1897 and 1896; while the total imports from the island in the five months of 1900 show an increase of 62 per cent. over 1898 and 172 per cent. over 1897, and the exports to the island show an increase of 104 per cent. over 1899 and 265 per cent. over 1897.

IMPORTS FROM PORTO RICO INTO THE UNITED STATES.

Month of	1896	1897	1899	1900
May	$430,821	$553,938	$647,1791,	$103,867
June	516,746	361,328	814,803	1,218,257
July	254,676	145,373	448,267	640,023
August	107,880	72,625	74,323	281,903
September	125,369	35,864	56,167	72,284
Total, 5 months	$1,485,492	$1,169,128	$2,040,739	$3,316,334

EXPORTS TO PORTO RICO FROM THE UNITED STATES.

Month of	1896	1897	1899	1900
May	$113,069	$161.845	$305,564	$696,479
June	173,313	167,138	361,423	890,999
July	101,944	156,296	213,302	529,729
August	194,361	143,945	251,843	408,638
September	130,058	130,578	246,490	282,064
Total, five months	$717,744	$768,802	$1,378,622	$2,807,909

The following table shows the exports from the United States to Porto Rico of fifteen representative articles during the five months ending October 1, 1900, compared with the same months of 1897:

Articles.	Five months ending Oct. 1.	
	1887	1900
Cotton cloth	$ 1,423	$406,194
Flour	294,278	402.912
Pork	75,829	94,567
Petroleum	12,930	65,956
Bacon	6,949	28,481
Coal	14,680	26,565
Cheese	1,062	26,463
Furniture	3,392	23,220
Builders' hardware	4,335	22,086
Cars and carriages	2,344	12,209
Books, maps, etc.	2,516	11,034
Fruits and nuts	399	6.077
Butter	3,151	5,420
Agricultural implements	1,217	3,856
Sewing machine	1,508	3,132

The abrogation of the Porto Rican tariff is being seriously discussed by the press of Porto Rico. The Porto Rican Tariff Act it will be remembered provides that "whenever the legislative assembly of Porto Rico shall have enacted and put into operation a system of local taxation to meet the necessities of the government of Porto Rico, by this act established, and shall by resolution duly passed so notify the president, he shall make proclamation thereof and thereupon all tariff duties on merchandise and articles going into Porto Rico from the United States or coming into the United States from Porto Rico shall cease, and from and after such date all such merchandise and articles shall be entered at the several ports of entry free of duty. The Porto Rican Legislature elected on November 6th, the date of the general election in the United States, is to meet shortly and will, under the provisions of the Porto Rican Act above quoted, have the power to immediately terminate the Porto Rican tariff by enacting legislation which will provide funds for the necessities of the government of Porto Rico and the question whether this

action shall be taken and the 15 per cent. tariff thus terminated, is being discussed by the press and public of that island as is shown by the following leading editorial taken from the San Juan (Porto Rico) *Daily News* of November 13, 1900, just received by the Treasury Bureau of Statistics:

"We have lived now for six months under the 85 per cent. preferential tariff. The question now is—is it good or bad? Has it helped or injured us? The Legislature will have these questions to decide.

"We now have the question to deal with aside and apart from politics. Its use as a campaign club is past and gone. The burden of deciding this very important question is solely upon the Legislature. As it decrees, so shall it be. If it desires to abolish the tariff and operate the island upon a free trade basis, it can be so ordered.

"If the people of Porto Rico through the Legislature, desire to continue the tariff it can be done. A precedent has been established which will permit this taxation. It has been legally decreed that such action is constitutional.

"If the tariff is abolished, it is at once evident that a more burdensome and higher rate of internal taxation must be imposed. Where and upon what shall this be levied, is indeed a perplexing question.

"Aside from all the difficulties that may or will arise from the abolition of the tariff, let us glance at the tariff itself and see what it has done. In the last six months the 15 per cent. tariff has afforded the island as much, if not more revenue than the 100 per cent. tariff. The theory that 'the way to increase revenue is by lowering the taxes,' is proven to be true for Porto Rico. This revenue will be constantly increasing as our trade increases, as it is sure to do. It has helped the consumer, for it has lowered the taxes he has to pay, not only on American goods, but upon all goods that enter our market in competition with them. This results in an increase of importations. This helps the producer by constantly providing him a means to carry his goods to the great American market, which is always so hungry for the products this island has to dispose of. Again, unless we have a traffic both ways, the steamers must make one trip without a cargo and the freight is thereby doubled.

"A tariff helps us as borrowers; it will give our securities a stand in the United States, which they could not have without a permanent revenue like the tariff revenue. The argument so often advanced in favor of a tariff tax as against other means of raising revenue, that it is easily collected, is especially forcible in Porto Rico. We would advise that the tariff is necessary, and if it were not it would still be the most convenient and logical means of raising our revenue. Let the tariff stand at 15 per cent."

MRS. MCKINLEY AND HER PRESENT HOME.

THE DIVERSIFIED FARM.

THE ENGLISH SPARROW.

The war which is being waged on the English sparrows in some farm sections is only partially successful through lack of co-operation. If every farmer would determine to keep the sparrows off his farm place, they could easily be kept in check. I have never allowed this species of Passer, which Congressman Lacey designates "rats of the air," to build or stay upon my Virginia place, and my several immediate neighbors through my solicitation have joined hands with me on this issue. Once rid of them, we have had but little trouble in keeping them away. They are ever ready to return however. During a year's sojourn in Florida two pair discovered my absence and built and reared breeds, keeping up a continual warfare with other birds. By fall the sparrows were thick on the place. On my return I commenced picking them off at odd times with a small rifle. In a week I had them so terrorized that they would fly away at sight of me, and after a little while they disappeared.

The harsh things that are said about the English sparrow are none too severe. Its meanest trait is that of driving off other birds. Among those which it whips are the wren, song sparrow, chipping sparrow, yellow bird, cat bird, oriole, blue bird and even the robin; in fact, fighting as it does in numbers, it will thrash and even kill almost any other bird. These insectivorous birds which the sparrow drives away are of more use to the farmer than he perhaps realizes.

Then the English sparrow preys upon almost every product of the farm and garden, from the early fruit bud to the ripe fruit and the mature grain. An exhaustive investigation made by the Department of Agriculture shows that hardly a crop is exempt from this pest's ravages. The evidence secured shows the sparrow to be so destructive as to be a serious menace to farm industry in many sections. Farmers report of their entire grape and other fruit yield being almost ruined and of thousands of the birds appearing persistently in their grain fields.

After all this, the English sparrow causes an increase in the multiplication of destructive insects and caterpillars instead of acting as a deterrent on them as was expected when the bird was foolishly imported from England. It does not eat the caterpillar itself and it keeps away the American birds which would feed upon them.

"The English sparrow," said Dr. G. Hart Merriam, the ornithologist of the Department of Agriculture, in discussing the pest, "is a curse of such virulence that it ought to be systematically attacked and destroyed before it becomes necessary to deplete the public treasury for the purpose, as has been done in other countries. By concerted action in the towns and on the farms and by taking advantage of this sparrow's gregarious habit much effective work can be accomplished against it with small expenditure. In the winter time, if food is placed in the same spot at the same hour each day for a week, the sparrows will gather in dense flocks to feed and great numbers can be killed at a time by firing upon them with small shot."

Dr. Merriam states that the sparrow is an excellent article of food, equaling many of the smaller game birds. This would not be strange considering its diet. At

restaurants it is commonly sold under the name of "rice-bird," even at times of the year when there are no rice-birds in the country. Nobody need have any scruples about killing, and eating if he wants, as many English sparrows as possible.

If the Department of Agriculture could only arrange to cross the English sparrow with some bird of brilliant plumage so that all sparrows would have beautiful red or blue wings or tails then there would be some prospect for their depletion of their numbers since American women will wear birds and bird' feathers on their hats. This would be doing the farmer more service than all the gseat work of free seed distribution which Congress forces the Secretary of Agriculture to carry out, each year.

SEED DISTRIBUTION.

Frederick V. Coville, the Botanist of the Department of Agriculture has a well thought-out plan in hand whereby the free-for-all-seed distribution now operated in the interests of "close Congressional districts" can be gradually transformed into a system of seed collection and distribution under which the original intention of the Department can be carried out, and new and presumably valuable seeds distributed to the proper localities throughout the country and experimented with. In other words Mr. Coville thinks it is possible to substitute a rational seed distribution for one which is, to say the least, almost useless from an agricultural point of view.

"There has been set aside," said Mr. Coville, "from the Congressional seed distribution appropriation, a special fund which the Department of Agriculture now devoting to a systematic prosecution of plant introduction work. Within the past three years new plants have been imported which are capable to adding enormously to the agricultural products of the country." He cited the introduction of Kiushu rice brought from Japan two years ago by one of the Department's agricultural explorers Dr. Knapp, as a means of saving the Louisana rice-planters a million and a h alf dollars a year. Mr. Coville also called attention to the introduction of Kafir corn, Turkey wheat, Turkestan alfalfa and the date palm, with which the Agricultural Department had more or lese to do.

He said: "About in 1888 Kansas began the cultivation of a cereal and forage plant from Egypt and India known as Kafir corn. In 1893 the value of the Kansas crop was $653,000; in 1896, $3,599,000; in 1897, $4,375,000; and in 1898, $5,842,000. The Turkey wheat now so extensively grown in the Great Plains is an immigrant from Russia. The cold-resistant variety of alfalfa recently introduced from Turkestan by the Department of Agriculture promises to effect an important extension in the cultivation of this crop into the higher and more northern plains. The date palm has not been successfully introduced into southern Arizona and extensive experiments under the auspices of the Government are under way."

SUGAR BEET EXPERIMENTS IN INDIANA.

For the past thirteen years the Indiana Agricultural Experiment Station has been conducting experiments on sugar beets in Indiana. The main purpose of this work has been to determine whether or not sugar beets might be profitably grown in this state, for sugar producing purposes.

This work has been conducted year after year with much care, and every opportunity has been made use of to ascertain Indiana's adaptability as a state to produce sugar from the beet. For years the station has distributed free seed each spring to hundreds of farmers over the state, who agreed to follow the directions given them, to plant the seed, grow the crop and send the station samples of the beets in the fall. Thousands of pounds of beet seed have thus been distributed, and each

fall a large number of beets have been received at the station from different parts of the state, and their sugar contents determined. No other experiment station in the United States, excepting Nebraska, so far as we are informed has attempted to conduct such long continued experiments with sugar beets, or grown experimental crops for so many years in the state, as has Indiana. Since 1888 inclusive, we have had experimental plats of beets in one or more parts of the state. In 1890 there were eight of these, in 1891 thirty-eight, in 1892 thirty-nine, in 1893 twenty-seven, in 1894 forty-seven, in 1896 five, in 1897 one hundred and forty-three. In 1898 the station sent seed to 1,169 persons over the state, while in 1899 and 1900 large amounts of seed were distributed, which farmers agreed to grow under the direction of the station. For years growers have planted one-eighth acre or more of beets under our instructions.

As a result of this work a great number of samples of the beets from nearly 70 counties in the State have been received at the station and their sugar contents determined. We have now on our records a large amount of information as a result of these years of work, which is favorable to the profitable production of sugar beets in the northern third of Indiana on certain soils suited to this crop.

In consequence of all this work, the station has decided to discontinue further distribution of beet seeds to our people and to largely curtail its sugar beet investigations. The station however, desires to keep in touch with our sugar beet growers, and will be pleased to examine free of charge all samples of beets sent us, under station instructions, in the fall of 1901. Farmers desiring to secure free seed for further trial on their farms, can no doubt obtain the same by applying to their congressman during the winter of 1900-1901.

Some time early in 1901 a bulletin will be published by the station giving a record of the sugar beet work of this institution during the past thirteen years, and the results attained. This will be mailed free to any one desiring a copy of the same.

C. S. PLUMB, Director.

THE CULTURE OF AMERICAN GINSENG.

The subject of growing Ginseng has recently received so much attention from the agricultural press of the country and from circulars and pamphlets sent broadcast throughout the country by dealers, that hundreds of people are being induced to try its culture.

Many of the articles are written by people who have no personal knowledge of the best way to grow it or of the profits to be derived thereby, Others are written by dealers who have seeds and plants to sell. and in both instances as a rule the information is second hand and unreliable. The most extravagant figures are given showing enormous yields produced on a given acreage and Monte Cristo fortunes to be made out of a paltry investment while one loafs in the back yard watching the gold dollars sprouting.

Certain dealers have sent out figures informing the public that $5.00 invested in their seeds and plants will show a value of $44,340.00 the fifteenth year.

A million dollar bed in twelve years from a $1000 investment is advertised on another page. A value *which cannot be obtained* except perhaps in small quantities is placed on the seeds and young plants and the ratio of increase and loss is given very accurately and more extravagantly *on paper*. Can any of these versatile writers please inform us how many turnips can be grown on a $5.00 investment in twelve years, the price the roots and seeds will bring each year and how rich a man will be at the end of that period? Certainly not and information pretending to figure it out would be absolute nonsense.

An article on Ginseng entitled "Valuable Farm Land" appeared in the St.

Louis *Republic* a short time ago and was extensively copied by other papers in the South and Southwest. Among other wild statements the writer said that seeds bring five cents each (another writer says there is unlimited demand at twenty-five cents each) and yearling roots 20 cents each; that the eighth year an acre should produce 3,120,00o seeds which sell at five cents each, giving an annual income to the fortunate grower of $100,000.00 from the seeds alone. He further states: "Say that a full crop of seed from one acre is available for planting. That will be 3,120-000 seeds. Allow for the loss and failure to generate or 120,000 seeds. This will leave 2,000,000 seed that are practically sure to generate and create 2,000,000 roots. In eighteen months these roots will be ready for market, and can be sold direct to consumers, the present price being 20 cents each or a total of $400,000 from the Ginseng crop in eighteen months. This crop of 2,000,000 roots would require a space of approximately forty acres. One acre should produce 52,000 roots, which at the market price of 20 cents each, should, after eighteen months bring a return of $10,400."

Could anything be more baldly ridiculous. Let us suppose that only 1000 gardeners had the above success as to yield. This would mean over three billion seeds put on the market each year, which at five cents each would require $150,000,000 annually to pay for them, not to mention the value of the roots.

Suppose further that the ratio of increase both in yield of crops and number of growers continued the same for twenty-five years there would not be money enough in the world to buy a single year's crop. China, the source of demand for Ginseng, would have used all their wealth in its purchase long before the twenty-five years had elapsed: notwithstanding these air castles there is an enormous profit in growing the plant, but it depends on the individual grower as in any other crop. The right conditions for its culture must be supplied, either naturally or artificially and intelligent cultivation given. There will probably always be a good demand for the root at high prices, and it is an article commanding cash at all times.

These conditions for growing are readily found in nearly all the States of the Union or can be produced at reasonable cost of labor and material. They may be stated in a few words: A rich, deep, well-drained, and moist soil, containing abundant decayed vegetable matter and not too heavy or clayey. Humus or vegetable mold, obtained by using decayed forest leaves is extremely beneficial, as is also thoroughly rotted compost. Shade sufficient to keep off the direct rays of the sun is almost necessasy, particularly in sections where the heat is excessive. Add to this careful cultivation and you have the secret, if there really be any, of growing Ginseng successfully. Lath covers are perhaps the best artificial shade and apple trees have been found good to keep the ground protected from the sun. At maturity the roots must be carefully and properly prepared for market, and the extra care taken to produce a fine article, clean, well graded and perfeccly dry is more than repaid by the much higher price such roots will bring.

The writer who has had many years of experience growing this root will be glad to give fuller information as to the best modes to be used in its cultivation, but would warn the reader against the wildly extravagant articles that appear from time so time and which will damage rather than help an industry that really does promise most unusual returns for the labor and expense necessary to cultivate it successfully.

HARLAN P. KELSEY.

SHEEP KILLED IN FEUD.

Reports from Sharpsdale say that the feud over the use of the range, which has long existed between cattlemen and sheep men, reached a climax this week when the cattlemen drove three thousand sheep over a high precipice. The entire country has taken up arms.

Germany's trade relations with this country are closely watched. Every attempt at German regulation of commerce is heralded as portending evil for American exporters to that country, notably the case last summer. Some tables just compiled by the Treasury Department, however, show that our exports to Germany in the ten months ending with October 1900, were $27,000,000 greater than those in the corresponding months of last year, an increase of about 20 per cent. and that our imports from Germany show an increase of $8,000,000 a gain of over 10 per cent. Of the forty great articles which compose the bulk of our exports to Germany more than two-thirds show an increase in 1900 as compared with 1899.

Exports to Germany of agricultural implements increased from $1,600,000 to $2,800,000; flour from $1,700,000 to $2,400,000; cotton from $30,000,000 to $58,000,000; fruits and nuts from $450,000 to $1,400,000; cotton seed oil from $810,000 to $1,000,000; salt beef from $210,000 to $360,000; also oil from $1,600,000 to $2,000,000; tobacco from $1,700,000 to $2,800,000.

The principal agricultural articles whose exportation to Germany have decreased are corn, from $14,400,000 to $13,000,300; wheat from $6,000,000 to $3,400,000 and ham and bacon from $2,300,000, to $1,400,000.

In spite of the report at every hand of the farm population turning citywards, the Census says that the farmers in the United States have increased 1,400,000 during the last 10 years. It would be a good thing if we could believe that men are going back to the land and away from the congested centers.

Humus is a term applied to the organic partially decayed matter in the soil. Leaf mold, wood dirt or a green crop plowed under form humus. Humus is the principal source of nitrogen in earth. Its action is beneficial not only in enriching but mechanically improving both heavy and light soils.

WITH OUR EXCHANGES.

THE FORUM.

From the thirteen articles that make up the December issue of *The Forum*, one may, without invidiousness, choose that by Mr. Henry L. West as likely to attract most attention. Mr. West reviews "The Programme for Congress" and his forecast is luminous and convincing. The Secretray of the Republican National Committee, Hon. Perry S. Heath, enumerates the "Lessons of the Campaign" in a pardonably exultant tone, and Mr. John Ball Osborne recounts "The Work of the Reciprocity Commission," which should prove interesting reading for the tariff-tinkers. In distant relation to the latter stands an article by Mr. John P. Young, the managing editor of the San Francisco *Chronicle*, entitled "The Economic Basis of Protection." In answer to Mr. Eugene T. Chamberlain, the United States Commissioner of Navigation, is an article entitled, "The Development of British Shipping," by Mr. Benjamin Taylor, an acknowledged authority on British navigation figures. Mr. J. I. Rodriguez, who was the unofficial adviser in Spanish law to the American Peace Commissioners at Paris, asks: "Can there ever be a Cuban Republic?" in an essay which may possibly foreshadow the course of the Administration in regard to Cuba. The "Progress in Penology" is reviewed at length by ex-Congressman S. J. Barrows, who is now the Corresponding Secretary of the New York Prison Association, and the "burning" question of "American Coal for England" is considered by Mr. George C. Locket, who is heavily engaged in England in that important branch of industry. Some of the remaining titles are "America in the Pacific," by Hon. John Barrett, late U. S. Minister to Siam; "The Chinese System of Banking," by Hon. Charles Denby; "Vacation Schools," by Dr. Helen C. Putnam; "The Education of a Millionaire," by Hon. Truxtun Beale; and "The Higher Education of Women in France," by Anna Tolman Smith.

MC CLURE'S.

In *McClure's Magazine* for December appears the first instalment of "Kim," the latest and most important novel from Kipling's pen. From the beginning it reveals itself as a masterpiece, worthy alike of its theme and of its author. Anthony Hope begins a series that will be welcomed by every wise reader. The "Dolly Dialogues" won for this brilliant writer his first prestige. The "Dolly" of those beguiling conversations was an artist's creation, a personality absolutely new in literature yet true living. That daintiest and most delicious of modern matrons was beloved by all for her piquant graces, her adorable minglings of naive and worldly wisdom. Now the author permits us new glimpses of this delictable lady, and in "More Dolly Dialogues," her witcheries re-assert their gentle way. An article of permanent value in this issue is the first of two in which are repeated "The Last Days of the Confederate Government." This was written by the late Stephen R. Mallory, Secretary of the Navy in the Confederate Government. He shared in the experiences of the administration during the closing days of the war and his personal narrative of those thrilling times is here given. There are, too some notable short stories in this issue, and the illustrations throughout are of exceptional merit.

SCRIBNER'S.

Raffles, the hero of E. W. Hornung's stories of the "Amateur Cracksman," will appear in the January number of *Scribner's* with a most remarkable adventure in crime. It has been suggested that Sherlock Holmes is the only man who could catch Raffles. Conan Doyle, the creator of Sherlock Holmes, is brother-in-law to Mr. Hornung. Other articles are: "Rodin" will be the subject of a critical article by W. C. Brownell. Henry Norman "Russia of Today." "Scappa" is a society which has done good work in England by devoting itself to the prevention of disfiguring advertisements, particularly in landscapes. The work is spreading to this county, and it will be fully described in the January *Scribner's* by Arthur Reed Kimball. Thomas F. Millard will contribute a critical comparison of the merits and defects of the various armies in the field in China.

THE DELINEATOR.

In the December *Delineator* are two Christmas stories by well known authors. One a negro story by Paul Laurence Dunbar, the colored protege of William Dean Howels, entitled "One Christmas at Shiloh." It tells of the home-coming of a reformed negro, and is very touching. The other by Beulah Marie Dix, who has dated her story in Colonial times and entitles it "In the Reign of Peggy." Kemble illustrates Dunbar's story with some of his famous negro faces, and F. M. Arnold illustrates the Colonial story. This famous old magazine, which for 27 years has occupied a unique position in the American literary world makes a great departure with the January number, just out, by printing a prospectus of what will appear in the twelve issues for 1901. With the *Delineator* in the house half a million women know that they have the very latest news at hand, set forth in such a way that by her own needle each woman can keep up to date positively and inexpensively. The science of housekeeping, the care of children in sickness and in health, the art of living and of living well, a life progressive in a home beautiful—all of these things the *Delineator* is acknowledged to be the best exponent in the world.

LADIES' HOME JOURNAL.

The Christmas Ladies' Home Journal offers a superabundance of literary and artistic features in attractive form. Among its nearly twoscore contributors are Mrs. Lew Wallace, Elizabeth Stuart Phelps, Charles Major, William Perine, Clifford Howard and Elizabeth Lincoln Gould, while A. B. Frost, W. L. Taylor, Reginald B. Birch, Henry Hunt, George Gibbs and as many other illustrators supply its pictorial features. Apart from the articles having special holiday timeliness of interest, the notable features of the Christmas Journal include The Innkeeper's Daughter, Who Dissolved a President's Cabinet, What May Happen in the Next Hundred Years, Jerusalem as We See it Today, Two Women's Gifts of Twenty-five Millions, The "Little Men" Play, a dramatization of Louisa M. Alcott's delightful story; Where Children See Saint Nick, The Fourteenth Man, Two Christmas Days at Rock Farm, and The Successors of Mary the First, The Story of a Young Man, and The Blue River Bear Stories, which are continued. Edward Bok has a thoughtful article on Christmas celebration, and there are various articles on women's wear, Christmas presents and edibles, while various other practical, helpful themes are ably presented. By the Curtis Publishing Company, Philadelphia. One dollar the year; ten cents a copy.

ODDS AND ENDS.

WILL IT PASS?

REPRESENTATIVE SHAFROTH INTRODUCED THE FOLLOWING BILL; WHICH WAS REFERRED TO THE COMMITTEE ON PUBLIC LANDS, AND ORDERED TO BE PRINTED.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that the Geological Survey is hereby directed to make accurate surveys of at least four practical reservoir sites and of the irrigating ditches leading to the reservoirs and to the public lands irrigated therefrom, in each of the arid-land States of the United States, and estimate the cost of the construction and completion of the same as well as the quantity of water which can be stored in each.

SEC. 2. That the Director of the Geological Survey shall make a report to the Secretary of the Interior as to each reservoir and irrigating ditch, showing the survey, cost of construction, quantity of public land in such State which can be irrigated from such reservoir, and the location of the said lands, as well as all other facts relative to the practicability of the enterprise.

SEC. 3. That upon the filing of such report the Secretary of the Interior may, in his discretion, withdraw from the public entry the lands embraced within the reservoir sites at high water mark, and a strip of ground fifty feet in width bordering on the same, and the land within fifty feet on each side of the center line of the irrigating ditches to be constructed in connection therewith, together with the public lands which it is proposed to irrigate from such reservoirs.

SEC. 4. That upon the determination by the Secretary of the Interior that the reservoir and irrigation project is practical, he shall cause to be let upon proper public notice contracts for the construction of the same: *Provided, however*, That contracts for the construction and completion of reservoirs and the irrigating ditches connected therewith in any one State shall not exceed the sum of one million dollars.

SEC. 5. That the following named States shall be considered as arid-land States within the meaning of this Act, to-wit: California, Oregon, Washington, Idaho Nevada, Utah, Montana, Wyoming, Colorado, Kansas, Nebraska, South Dakota and North Dakota.

SEC. 6. That the sum of thirteen million dollars, or so much thereof as may be necessary, be, and the same is hereby, appropriated, out of any money in the Treasury not otherwise appropriated, for the purpose of carrying into effect the provisions thereof.

SEC. 7. That upon the completion of each irrigation project the lands to be irrigated thereby shall be subject to homestead entry after notice by the Secretary of the Interior upon the condition that, in addition to the requirements of the homestead Act, the entryman, on the making of a final proof of settlement, shall pay to the Government the sum of two dollars and fifty cents per acre and each entryman shall be limited to the entry and settlement of eighty acres.

SEC. 8. That when the major part of the land intended to be irrigated from each reservoir has been duly located upon as aforesaid, the management of the reser-

voir and irrigating ditches connected with the irrigation project shall be turned over to the said homesteaders, who shall manage and maintain the same either as a body or through a corporation formed by them.

SEC. 9. That nothing in this Act shall be construed as interfering with the laws of said States concerning irrigation.

SEC. 10. The Secretary of the Interior is hereby authorized to make such rules and regulations for the purpose of enforcing the provisions thereof as may be just and proper.

WHAT CHANCE HAS A MAN AT FIFTY?

The critical age in the life of a man well preserved is certainly 50. At that age man really reaches his maturity. His mind, having spent half a century acquiring knowledge of the world, ought to be in condition to do its best work. His body should be vigorous as ever and more than ever free from illness or other troubles that go with youth.

At 50 man is either hopelessly gone to the bad or he has recovered from his foolishness, got over experimenting with folly on his own hook, as we all do, and has begun to live the serious life that was mapped out for him in the earth's planning.

A few freaks in history have achieved their great success long before 50 and are old at that age. But of the world's great men a majority have begun to be something only 50 years after birth.

Modern life has two ways of looking at the man of 50. The successful man is the "wonderfully successful man, and so young, too" Mr. Bryan, nearing 50, is called a "boy orator." Mr. Chamberlain, past 60, is a considerable English statesman, "considering how young he is."

The man not successful is seen at 50 in a sadly different light.

When he wants to work, there is nothing against him except that a "young man is wanted." If he seeks work as a mechanic, or on a railroad, he is afraid to take off his hat, lest the thin hair, turning gray, be noticed.

Hair dye, almost unknown now in barber shops frequented by prosperous men, is sold extensively in cheap little shops—men of 50 dye their hair to get work.

There is no reason why any man who has lived sensibly up to 50 should not be at his best when 50 comes. There is no reason why a man should not at 50 take a new start, if he has the mental energy and hopefulness to do it.

The trouble with the average man past 50 is this:

He thinks he is old. He allows himself to sink down and begins looking backward. The elasticity dies out of him, and elasticity means success in a man as it does in a sword blade.

Human beings are largely made by autohspnotism, or unmade by the lack of it. We hypnotize ourselves. We believe that we can do a thing, and then we do it.

Ask a young woman to break down a certain door, and without hesitation she says that she can not do it. She thinks she can not and therefore she can not. But let the house be burning and her child on the other side of that door. A different story may be told. She thinks she can burst open the door. She feels that she must and will. And hypnotized by her own will power, she performs marvels almost incredible.

So it is with men and women at all stages. While the determination and will power are there, they are young and capable of successful accomplishment, no matter what their age.

Success keeps us confident, and the successful man at 50 works well—better than ever. Lack of success weakens confidence in one's self, and that weakened self-confidence accounts for the sad and unnecessary failures of many middle-aged men.

A man of middle age—if he has not wasted his force in dissipation—is as good

as any younger man, and usually better. But he must believe that he is good, he must feel confidence in himself.

One good thing for a man of middle age to do is to read the lives of successful men. Read of Admiral Blake, who saved England's naval reputation, yet never went to sea in command until past middle age. Read of almost any of the world's great successes. You will find that success comes late. Of course it must come late in the natural order of things. The man who succeeds must surpass others. No matter how able he may be he must first learn what others know, and that takes time. It usually takes about fifty years. After spending about one-half of his intellectual life getting even with other men of ability, acquiring his supply of knowledge the successful man goes ahead and beats his fellows in the race.

The great thing is not to be discouraged —discouragement means failure inevitable.

Another very important thing is to remember that middle age is really youth, or should be, therefore, let the man of 50 not be ashamed or hesitate to do at 50 the work that he would do at 30 or 20.

Let the middle aged man simply say to himself: "I am not old, and I'll prove it. I'll take the work that comes. I'll succeed in it better than the very young man because of my steadiness, and although I am beginning now where I should have begun ten years or more back, I'll not let that fact discourage or handicap me. I'll succeed now and think of other things later on."

COLONIZING CRUSOE'S ISLAND.

Robinson Crusoe's island, Juan Fernandez, is about to be turned into a colony.

Robinson Crusoe, or rather a prototype of Robinson Crucsoe, existed under the name of Alaxander Selkirk. That Defoe knew Selkirk's story there can be no doubt, for he closely kept to the facts of Selkirk's existence on the island of Juan Fernandez.

Even the story of Crusoe's man Friday has a foundation of truth, for Selkirk rescued a stray Indian from death.

Barren as the place seemed to Selkirk, it contains many flourishing spots. The fruit trees which he planted have reproducod themselves, and peaches, quinces, pears and grapes, are in abundance. A man who had a stock farm on the island for some reason abandoned the undertaking several years ago and turned his live srock loose. Cattle, sheep, goats and pigs are now found in a wild state, so that the colonists are likely to have some good sport.

The island, which is in the Pacific ocean, has been occupied by a few German and Chilian families, numbering about fifteen persons in all. It is now proposed by the Chilian government to turn the island into a colony, and about 150 hardy Chilians will form the nucleus of the settlement, which it is proposed to christen "Crusoe's Island."

The cottage which Selkirk built snd which Defoe describes, still exists as a broken-down shanty.

WEIGHING THE BABY.

The story is of a young and devoted father. The baby was his first, and he wanted to weigh it.

"It's a bumper!" he exclaimed. "Where are the scales?"

The domestic hunted up an old-fashioned pair, the proud father assuming charge of the operation.

"I'll try it at eight pounds," he said sliding the weight along the beam at that figure.

"It wont do. She weighs ever so much more than that."

He slid the weight along several notches further.

"By George!" he said. "She weighs more than ten pounds–11–12–13–14! Is it possible?"

He sat the baby and the scales down and rested himself a moment.

"Biggest baby I ever saw," he panted, resuming the weighing process. Fifteen and a half–16! This thing won't weigh her. See, 16 is the last notch, and she jerks it up like a feather! Go and get a pair of scales at some neighbor's. I'll bet a tenner that she weighs over 20 pounds, Millie!" he shouted, rushing into the next room; "she's the biggest baby in this country – weighs over 16 pounds!"

"What did you weigh her on?" inquired the young mother.

"On the old scales in the kitchen."

"The figures on those are only ounces," she replied, quietly. "Bring me the baby, John."—*Pearson's Weekly.*

GOV. MOUNT'S ADVICE.

Governor Mount, of Indiana, has written some suggestions to boys which are wise and well put. We quote the "five fundamental principles" which, he declares, are essential to success, and lie at the foundation of good citizenship;

Discipline. Obedience to constituted authority, self-control, discipline of the will, of the tastes, the passions, the aspirations, the habits. "He that ruleth his spirit is greater than he that taketh a city

Love of home and country. I never knew a boy who loved his home, his parents, his brothers and sisters, and to whom it was a joy and pleasure to respect and obey his parents, who ever brought grief to his home or dishonor to his family.

Through the tempting and dangerous environments of war, and the multiplied conditions since, I have found it a pleasure steadfastly to keep the boyhood promise I made my mother never to use tobacco or intoxicants. From a life of experience I can earnestly commend the wisdom of making and keeping such promises. The love of country is interwoven with the love of home.

Habits of industry. I would prefer that my child be reared in the most unpretentious cottage and trained to habits of industry and economy than to be brought up in a stately mansion, surrounded by the enervating influences of wealth, ease and idleness. "An idle mind is the devil's workshop."

Principles of temperence. If greater energy were expended in teaching the principles of temperence to the youth in the schools and in the home there would be less demand for temperence laws and fewer victims to the drink habit. The increased consumption of tobacco and the widespread indulgence and the evil effects of cigarette smoking are assuming alarming proportions.

A purpose in life. I would impress upon the mind of every youth the motto of Longfellow "I am determined to be intensely something;" or that of Emerson: "Hitch your wagon to a star.' Intensity of purpose, a resolute determination, with indomitable will-power oupled with the foregoing principles, are he essential factors which will win in the battle of life.

MIKE'S SONG.

I'm Michael McCarty,
So hale and so hearty—
I work ivery day in the year;
The horses all know me,
The cattle all show me
They know they have nothing to fear.
Stan' up for the brutes,
An' the birds if it suits,
An' the chickens an' turkeys alone,
For God made 'em all,
An' they came at his call,
An' He gave them to man for his own.
We shouldn't abuse 'em,
Nor cruelly use 'em;
Begorra! I know I am right,
An' before ye shall do it,
I'll have ye to know it,
'Tis Michael McCarty y'll fight.

[*From "The Strike at Shane's."*]

THE WAY WARS BEGIN.

Tommy was reading the war news. When he finished reading he came over to his mother and said:

"Mamma how do wars begin?"

Well, suppose the English hauled down the American flag, and that the Americans—"

Here Tommy's father intervened.

"My dear," he said, "the English would not—"

Mother– "Excuse me, they would–"

"Now, dear, who ever heard of such a thing?"

"Pray do not interrupt."

"But you are giving Tommy a wrong idea!"

"I'm not sir!"

"You are, madam!"

"Don't call me madam! I wont allow you!"

"I'll call you what I choose!"

"I'm sorry I ever saw you; you are so—"

Tommy (going out)—"It's all right; I think I know how wars begin." —Tit-Bits.

WHAT I LIVE FOR.

I live for those who love me,
Whose hearts are kind and true,
For the heaven that smiles above me,
And awaits my spirit, too;
For the human ties that bind me,
For the task that God assigned me,
For the bright hopes left behind me,
And the good that I can do.

I live to learn their story
Who've suffered for my sake,
To emulate their glory,
And to follow in their wake;
Bards, patriots, martyrs, sages,
The noble of all ages,
Whose deeds crowd history's pages,
And time's great volume make.

I live to hold communion
With all that is divine,
To feel there is a union
'Twixt Nature's heart and mine;
To profit by affliction,
Reap truths from fields of fiction,
Grow wiser from conviction,
And fulfill each grand design.

I live to hail that season,
By gifted minds foretold,
When men shall rule by reason,
And not alone by gold;
When man to man united,
And every wrong thing righted,
The whole world shall be lighted
As Eden was of old.

I live for those who love me,
For those who know me true,
For the heaven that smiles above me,
And awaits my spirit, too;
For the cause that lacks assistance,
For the wrong that needs resistance,
For the future in the distance,
And the good that I can do.

—*George Linnaeus Banks.*

THE IRRIGATION AGE.

VOL. XV . CHICAGO, JANUARY, 1901. NO. 4

THE PROGRESS OF WESTERN AMERICA.

Death of a Good Man. Philip D. Armour, the Chicago packer, died Jan. 6. He made a success of his life from beginning to end. He never allowed his accumulating wealth to lead him out of his accustomed life of liberality and honesty. From a farm-boy he started for California where he first made a beginning, and ended in Chicago, from where he fed the world. The Armour Institute you might say was an inspirateon, for it was after listening to a discourse by Dr. Gunsaulus where he told what he thought should be done for the boys and girls of the present generation, that Mr. Armour ask the dootor if he believed in the views he had just expressed.

"I certainly do" responded Dr. Gunsaulis.

"And would you carry them out if you had the means?"

"Most assuredly" came the reply.

"Well, then," said Armour "give me five years of your time and I will give you the money."

The institute was built, and will be a monument to as good a man as ever lived.

South Africa. The war in South Africa, that the Englsh have tried to pursuade the universe is but a skirmish with a few insane bushwhackers and amounted to merely nothing, has assumed new proportions. Several engagements lately have reached the dignity of actual battles, and under the leadership of Gens. Dewet and Delarey the Boers have shown a bravery that surpassed anything of the kind in the early part of the war. Not long ago the band of Delarey swooped down upon Gen. Clements men, and after a sharp engagement made prisoners of 550 of the Northumberland and fusileers, and killed and wounded many others. This was in the Western Transvaal. Down near the Orange river Gen. Dewet has been conducting some extraordinary military operations, and all England is in despair over the showing of the Boer strength. That the Boers must ultimately succumb to the superior number is inevitable, but those who are supplying the money and men are about discouraged. Meanwhile Mr. Kruger has dined with Queen Wilhemina been entertained by the French, and is receiving invitations from all over the world by the common people to come in person, to agitate intervention, and though the rulers may stand by England, the sympathy of the masses is with the Boers.

Fight for a Baby. Last spring a young couple of Kenosha, Wis., eloped and were married at Milwaukee. In the fall the young wife was stricken with a fatal malady and recently died leaving a young babe. Last week the father called at the residence of his wife's mother and demanded the child that had been left by its mother to be cared for by

its grandmother. The grandmother refused to give it up. The father persisted. When the grandmother ran to the telephone, which was in another part of the house, the father ran into an adjoining room where the nurse was washing the baby and took it from her arms before she realized what he was doing; with the half dressed child in his arms he rushed out of the house, followed closely by its grandmother, who ran back at the nurse's screams.

The grandmother overtook the father in the middle of the lawn and seized him by the throat. He struck at her desperately, but was handicapped by having the baby in his arms. And there, in the most aristocratic part of Kenosha, facing the Simmons' Library, in Central Park, the grandmother and the father did battle.

In the midst of the struggle, which attracted a crowd of neighbors and passers by, the nurse succeeded in wrestling the baby from the father, who was being choked on the ground by the maddened grandmother.

The doctors were immediately called who pronounced the child in a precarious condition from the exposure.

Its all Right. The Secretary of the Interior in his late report takes the position that private enterprise in irrigation has used up all the opportunities in its reach, and have thereby demonstrated its value, so that the nation, in taking hold of irrigation on a larger scale can do so with practical assurance that it will be a success. He does not make specific recommeéations, contenting himself with the feasibility and leaves the rest to congress.

Comments of the Press. A subject for general congratulation to the West is the broad national manner in which the Eastern press has treated the problem, since the Chicago Irrigation Congress brought the subject prominently before the country. With hardly an exception the great dailies from Omaha to Cape Cod have cordially commended the national irrigation movement from every standpoint, and have pointed out the great good which would accrue to the nation through its practical application, at the same time showing that the Federal Government is the logical and only agent which can most successfully put into operation a plan of general reclamation.

Needs Western Pushing. If this is the sentiment throuhout the East—a feeling of willing and friendly co-operation—the West should certainly arise stimulated to lend every energy and put forth every possible effort to push its case before Congress.

Lack of organization and failure to co-operate are main causes which have retarded the development of the West and kept Congress from taking up the question of the reclamation of the arid lands. Were they organized there are enough non-resident property owners of the West to carry through Congress any legitimate measure for public improvement.

Opportunity for Organized Effort The failure of Western commercial interests to recognize the opportunity of pushing the national irrigation movement as a national issue, and act unitedly in urging the matter upon Congressmen, is responsible for the apparent lack of interest in the cause shown by some localities, and this has prevented the Western members of Congress from pushing the fight as they would have done had they been loyally and vigorously supported at home.

Hopeful Signs. The indications are, however, that the country is approaching the time when, if the people of the West will use plain, ordinary business sense, and stand solidly together behind their representatives in Congress, eliminating any sectional controversies, the appropriations bill may, without opposition, contain each year good sized sums for the systematic reclamation of the irrigable area of the West.

DESERT RECLAIMED BY IRRIGATION.

Prof. F. H. Newell, of the United States Geological Survey, writes in the *Boston Herald* that the tree is the mother of the fountain. "Save the forests. Store the flood waters. Reclaim the deserts. Annex arid America."

That is the slogan of the National Irrigation Association. The marvelous growth of the movement fostered by this organization, which held its ninth annual congress at Chicago a few weeks ago, is attracting the attention of the public in the East, as well as in the central and far West. The magnitude of the problem the organization has bravely set out to solve and the influence and energy it is bringing to bear are well worth considerate attention.

Millions of acres of barren land that might be made arable; miles of territory now uninhabited that should support many thousands of prosperous families. That is the proposition now being wrought out.

To persons who are not familiar with the matter many questions naturally arise. The first and most comprehensive is: What is the National Irrigation Association, and what does it seek to accomplish? Briefly, this organization, composed of men identified with the manufacturing, transportation, and commercial interests of the country, as well as those in professional occupations, is seeking to provide the largest possible number of homes upon the public domain.

This can come about only through a wise administration of the resources in water and forests, since upon these depend directly the value of the vacant public lands. But why should not these matters be left to the Washington authorities to settle? Simply because the congress at Washington has not given serious attention to the matter, and the conditions are becoming so ominous for the future that the business interests of the country, as well as the philarthropists, have begun to take alarm.

The great public domain, one-third of the whole United States, is being administered not to make the largest number of homes, but rather the reverse. Under wise laws and institutions, framed with a knowledge of the facts, ten families can obtain a good living where now one is scantily fed.

But why should not this be left to private enterprise? It has thus been left, and individuals have siezed upon all they could grasp, and in many instances have ruined the opportunities for making homes for tens or hundreds of other individuals. The treatment of the arid

public land has been comparable to that of a poorly tended orchard, where each apple has been bitten by a bird or insect—the amount actually consumed is relatively insignificant, but the fruit is spoiled. One man by securing title to a few acres controlling the water supply, nas virtually become possessor of thousands of additional acres which might otherwise have been used for farms. The opportunities for doing this on a small scale have largely been seized, but by combinations of capital they may be indefinitely extended.

Why not leave the development to corporate enterprise, as in the case of railroads? This also has been tried, and large irrigation systems have been built. In nearly all instances these have been financial failures, although of great benefit to the country. It is highly improbable that more capital can be brought to construct those costly works unless the most stringent and oppressive monoply can be created. If well administered the benefits are such that they cannot accrue solely to a water company, but the public gains at the expense of the investor. The latter becomes an involuntary philanthropist, simply because he cannot control all the returns which come from his investment.

In other words, these works, when successfully built, benefit the community, but not the owner The situation is comparable in some respects to that in building lighthouses, improving harbors or public roads—the corporation or the individual who expends the money cannot be sure of securing remuneration for his enterprise.

Why not turn over to the states in which they are situated all these lands, and let each state attend to the matter? This has been frequently advocated and tried in a small way, but the state in which these lands are situated are for the most part poor, and the lands themselves must be used as a basis of security for money obtained; in other words, the lands must be sold or rented to secure funds, and this in the past has invariably resulted in putting the lands into the hands of speculators—the very thing to be avoided.

The national government is the owner of these millions of acres of fertile but arid land, and, as the owner, has duties as well as privileges. But the question may be asked: Why should the East be taxed to assist in developing the West? The answer lies in the fact that the prosperity of one part of the country is closely linked with that of another.

But the farmers of Illinois and Indiana say: We do not want more agricultural land and more products brought into the market, as will result from the creation of more small farms in the West.

This is a mistake founded upon ignorance. The products of the arid and semi-arid region cannot compete with those of the humid. Different crops seeking a different market are produced. The products

which come East are almost wholly semi-tropical or the more expensive dried fruits. The ordinary farm crops of Illinois are protected by the heavy railroad tariff from the competion of the far West.

Now, what is the reclaimed country like, and what is to be done?

Briefly stated, there are, in round numbers, nine hundred and fifty thousand square miles, or six million acres of vacant public lands. Of these three hundred and seventy-four million acres are suitable for grazing, ninety-six million acres are covered with woodland in which there is also grazing, and from which fuel, fence-posts, etc., can be had; there are seventy million acres of forests of commercial value, and about an equal area of absolutely desert land, having no present value.

There is water sufficient for the irrigation of from seventy-five million to one hundred million acres, depending upon the methods of conservation employed. The average size of an irrigated farm is about forty acres to a family of five persons, not including in this the grazing or range land.

Probably ten million people could find homes on farms and be self-supporting if the water supply were properly regulated.

This would mean an enormous development of the mineral and other resources, which, with the prevailing scanty population, will thus be vastly augmented by the mining and other industrial occupations, as well as by the merchants and related trades. The experience of the old world has shown that there is almost no limit to the density of population within the arid region, where, with ample water and continuous sunshine, the soil produces the most wonderful succession of crops.

At present the vacant public land can be considered under two heads; that which is truly arid and that which is semi-arid or subhumid. In the case of the first, it is impossible to make a home without providing a water supply. In the case of the second, however, there are years when large crops can be produced. Settlers have rushed in during these times of unusual moisture, have attempted to make homes, and when, year after year, the crops have been lost through the prevailing drought, the farmers have become impoverished and have finally abandoned their homes, as has been the case in western Kansas and western Nebraska.

The soil of these drought-stricken regions is notably fertile when watered, and the luxuriant vegetation which followed an occasional rain lured on the pioneer to his ruin. Farming there is a gambling operation, in which the occasional high winnings cause thousands to lose their judgment and risk their efforts in a hopeless undertaking.

The semi-arid regions include the great belt of country extending from western North Dakota through the western portions of South

Dakota, Nebraska, Kansas, Oklahoma, Texas, and the eastern part of Colorado. Here may be found thousands of ruins, indicating the attempts made to secure a foothold without first providing a water supply. It is truly the land of famine, for, like all the great famine regions of the world, its soil is extraordinarily rich and everything is conducive to prosperity except the one factor of rainfall.

While the government has not taken up seriously this matter of the reclamation of the arid and semi-arid lands, congress has authorized various investigations by the Department of the Interior, in whose charge are the public lands, and by the Department of Agriculture. In 1888 the geological survey was authorized to investigate the extent to which the arid lands could be redeemed by irrigation, and since that time it has been systematically measuring the streams, surveying reservoir sites, and obtaining facts and figures on which to base an estimate of the cost of reclamation.

Not only are the surface streams being measured, but investigations are being made of the underground waters and their movements. Maps showing the depth of water-bearing beds beneath the surface are being prepared, showing by lines or colors the depth to which a well must be sunk in order to reach the pervious rocks. In localities where artesian wells occur these maps also show the height to which water will rise above the surface. Many of the desert valleys of the West are thus being watered by the apparently unlimited supply lying far beneath the dusty surface.

Among the most notable of the recent works of the geological survey are the examination of St. Mary's River in Montana, and of Gila River in Arizona. St. Mary's River, receiving water from the snow clad Rocky Mountains flows along the eastern base of these into Canada and carries away to the north the waters needed on the dusty plains still further to the east. Milk River, a tributary of the Missouri, rises against the side of St. Mary's River, and is cut off by the well-watered mountain area. It is thus a mere brook or rivulet, except in times of storm.

The division of hydrography of the geological survey has demonstrated that the water from St. Mary's River can be conducted around into the head waters of Milk River and kept on the south side of the Canadian boundary, flowing eastward to the parched, fertile lands of the Milk River valley.

The surveys have not yet been brought to completion, but it is probable that several hundred thousand acres can be irrigated at a cost not prohibitory, providing homes for thousands of families.

In the extreme south it has been shown that reservoirs can be built on the Gila River, storing up the flood water for the public lands and for the supply of the Indian tribes residing along this stream.

These Indians have from time immemorial supported themselves by agriculture through the use of these waters; but in recent years the activity of the white settlers has resulted in depriving them of the water and they are reduced to penury. Thousands of dollars are being expended to educate these Indians, but at the same time, they are forced to live in idleness and are not allowed to continue the agricul ture of their forefathers.

IRRIGATION IN RHYME.

How dear to my heart is the prospect of riches,
When dizzy old age comes along by and by,
A farm in the west with a number of ditches,
And life would be one constant Fourth of July.

How sweet is the sound of swift flowing waters,
That course near the fields of alfalfa and oats,
A sod house to shelter my sons and my daughters,
A monster frame barn for the horses and colts.

Thus blessed in old age life would be worth living;
No failure of crops from the desolate drouth,
Each day would indeed be a day of thanksgiving;
A prayer in my heart and a song in my mouth.

The best thing I know of for saving the nation,
Is found in the creed of the people now here,
Whose motto is "ditching," whose pass "irrigation,"
Who stand up for water as some do for beer.

No more hot winds will sweep over the prairies.
To wilt the potatoes and wither the rye,
When the people dig ditches from Dundy to Cherry,
And keep them bank full in the sweet bye and bye.

There'll be ample cause then for constant rejoicing,
When money is plenty and crops never fail,
For all will be happy and nobody voicing,
The gruesome refrain of calamity's wail.

—*National Advocate.*

CONDITIONS FAVORABLE AND UNFAVORABLE TO IRRIGATION.

By J. Ulrich.

Irrigation, in the Rocky Mountain States, is almost wholly a matter of gravity. The stream is tapped at a point where its channel is higher than the field to be watered. Thence the water is carried down hill in the ditch to the highest point to be covered. In spreading it over the field the laterals run on the ridges, and the shovel of the irrigator manipulates its distribution along or across the slopes below. When it has thus been brought to a level with the most elevated points upon the tract to be irrigated, it can be made to flow out over the land by the force of gravity alone, without any assistance from the irrigator beyond such manipulation as may be required to effect its uniform distribution over the minor irregularities of surface, which are eliminated as far as possible by careful leveling and preparation of the ground before irrigation is attempted.

Sometimes the water supply lies at a lower level than the land to be irrigated, and has to be raised. This occurs where the water supply comes from wells or other subterranean sources. In such cases it is raised to the required elevation by pumping, or by any other method which is found most convenient and economical. Pumping water for irrigation, because of the large volume required, is attended with great expense and can not usually be employed with profit except for the reclamation of land devoted to the cultivation of crops which represent great value per unit of area devoted to their production. In the cultivation of oranges, lemons, and other fruits which yield a product whose value is several hundred dollars per acre, and where the amount of water required is relatively small, pumping may be resorted to with profit; but in the growing of cereals and the ordinary farm products of the temperate regions, the cost of the pumping plant and its operation is often prohibitory.

In most cases, however (in all where irrigation is conducted upon an extensive scale), the water supply is obtained from running streams, which in the arid region generally have very high gradients, thus rendering their diversion upon the adjoining lands comparatively easy. Where the land to be irrigated lies along the immediate border of the stream and is but little elevated above the latter a dam

may be constructed which will serve to elevate the water to the required level. This is a practice very frequently adopted in irrigating low bottoms, but is applicable only where the land is but slightly elevated above the stream; as where its elevation is very considerable the height of dam thus required would, in most cases involve an expense prohibiting its building.

Frequently the lands to be reclaimed occupy positions remote from the streams whose waters are to accomplish their irrigation, and are elevated several hundred feet above it. In such cases neither pumping nor damming the stream would be feasible, on account of the expense involved. If the stream had but a slight fall, land so situated could not be irrigated from it at all. One of the characteristics of the streams of the arid regiou, however, as noted above, is the excessive declivity of their slopes. There are few whose fall is less than 4 or 5 feet per mile and 40 feet is not unusual, especially in the case of the smaller streams in the vicinity of the mountains. When, therefore, it is desired to irrigate a body of land which occupies a position of great elevation above the stream selected as its source of supply, the elevation of the latter does not necessarily prohibit the enterprise, because, while at all contagious points along the stream the water is much below the land, the excessive fall characteristic of these water courses permits of the selection of some point farther upstream, whose elevation exceeds that of the land whose irrigation is desired, and from this point its waters may be conducted by means of a gravity canal to the lands to be reclaimed. This point of diversion may be, and frequently is, many miles up the river from the lands to be watered.

The lands irrigated usually lie between the ditch or canal and the stream furnishing the supply, and below the former. The water is drawn off by letting it out of the artificial conduit and permitting it to run over the lands below.

It is evident, however, that under some conditions irrigation can not be thus accomplished. If, for example, the irrigating of a body of elevated lands were contemplated from a stream whose rate of fall does not exceed that required by the canal through which the waters are to be conveyed to the land, the latter could not be covered. It would also be impracticable to irrigate an elevated body of land from a stream whose fall exceeded but slightly that required for the canal through which the water is to be conveyed to the land. If a canal whose slope must be 6 inches per mile is designed for the irrigation of land lying 150 feet above a stream whose slope is 1 foot per mile, its point of diversion would have to be located 300 miles up the stream from the lands to be irrigated, and the enterprise would consequently be impracticable. For these reasons much of the land

in the humid regions could not be irrigated by gravity canals, even if the necessity existed, since the streams, while affording an abundant supply, have generally such low gradients that the diversion of their waters through gravity canals could not be successfully accomplished.

HOW CANALS AND DITCHES HAVE BEEN BUILT.

It is not so very long since the settlement of the arid portion of the United States, and especially the carrying on of agricultural operations within its limits, was pretty generally regarded as impracticable if not impossible. Its actual development is already far beyond the dreams of half a century ago, and we do not yet realize its ultimate possibilities. As a consequence the importance of irrigation and the various problems connected therewith have not been generally realized or understood. In the older irrigated countries the construction and operation of canals, as well as the distribution of water, is under the most strict government supervision and control, if not ownership. The wisdom of the system of operation measures in a large degree the prosperity of the people who live under it. Our system is yet in a primitive condition. The development thus far reached has been under any comprehensive public policy, but is rather a natural outgrowth of conditions.

THE SMALL DITCH OF THE PIONEER IRRIGATOR

During the earlier period of the settlement of the arid region, before the possibilities of irrigation had come to be generally recognized, and prior to the advent of a population sufficient to warrant definite efforts toward organization in the development of its resources, irrigation was limited to the individual enterprise of pioneer settlers who formed the advance guard of civilization upon the frontier. These pioneers, have selected suitable locations for farming and ranching operations, constructed each his own ditch for the irrigation of his individual lands, and operated it independently in the manner best suited to his interests.

The individual ditch appeals to the inherited prejudices and habits which the settler brings with him. Even if it costs more, he often prefers it to the enforced submission to regulations which dependence on partnership ditches or canals involves; hence on each stream the locations for such ditches are early sought out. When those in the main valley are gones, locators look higher up in the mountain valleys and along the rivulets which go to make up the main stream. These opportunities still exist in some parts of the country, but they are rare, and hard to find. The pioneer makes use of all such opportunities, and they are now to be found only along water courses remote from the centers of population, where all the drawbacks of the frontier must be encountered. The gain in first

cost is thus counterbalanced by the attendant disadvantages of location. The building of individual ditches is, therefore, largely a thing of the past.

EVOLUTION OF THE COMMUNITY DITCH.

The evolution of irrigation on the majority of streams has followed the same successive steps. Frequently the ditch of the pioneer was so located as to be conveniently and economically enlarged and extended to cover the lands of the subsequent settlers. In such cases arrangements were often made with the original owner by which such enlargements and extensions were made and the later settlers became part owners in the ditch, which has often been enlarged and extended many times and thus grown from the small ditch constructed and owned by the first settler to a large partnership or community canal, in which each owner of lands irrigated by it has purchased or worked out an interest, and contributes to its annual maintenance in proportion to the amount of water used by him.

After the available lower lands near the stream have been taken up and rendered irrigable by the individual or partnership ditches, larger and longer canals are often projected to cover the mesas and benches above. These are also often built, owned, and operated by the owners of the lands to be reclaimed by them, the principal outlay being their own labor. These partnership or community canals have generally proven successful and satisfactory, and have been a most important factor in the development of the agricultural resources of the arid region. Their construction and operation are usually simple, and their value represents wealth created by the people who live under them. The operation and maintenance of such canals is generally satisfactorily accomplished through mutual agreement, by proportionate assessments of labor or money upon the various owners. The annual expense of operation is generally very small, and the value of land under such canals (which usually includes a proportiooate ownership in the canal itself) is usually greater than that of similarly situated land under corporation canals. In many respects, where it is applicable, this individual or partnership system of canal ownership is an ideal one.

Although partnership and community canals, especially those which have grown up by the enlargement and extension of smaller individual ditches, are usually unincorporated mutual associations as above described, yet it often happens that a closer and stronger organization than one department upon mutual agreement is desired by the irrigators, and the result is the formation of the community irrigation stock company. In such a corporation the stockholders, as a general rule, are the farmers who expect to use the water thus

made available. It generally originates and is organized in the following manner:

A body of lands suitable for farming purposes, and so situated with reference to a river or other satisfactory source of supply that it can be irrigated with a reasonable degree of economy, is located and acquired by digerent individuals. If government land, it is secured through the regular homestead or desert-land filings. If belonging to the state or a railroad company, it is acquired through purchase. Sometimes both State and Goverment lands are available, of which the alternate sections belong to each, respectively. In the case of Government lands, many of the filings may have been made long before the irrigation proposition in question had assumed definite form, the same having been made upon the assumption that irrigation was sposible and would sooner or later become an accomplished fact.

For the purpose of specifically illustrating the method of organizing and conducting the affairs of such a community irrigation enterprise, it will be assumed that a number of individuals have made filings upon different tracts of Government land, comprising in the aggregate an area of 8,000 acres, or that they have acquired the same area through purchase from the state or from a railroad company. This land is, of course, arid and unproductive without water, and before its irrigation can be effected a canal or other conduit must be constructed for conveying thereto the waters of some adjacent stream. A meeting of the owners of claimants is therefore held, and the necessary plant is agreed upon; the amont of water required, the size of canal needed, and the approximate cost of the undertaking are determined; and a board of directors is elected, who appoint the executive officers for conducting the affairs of the company. It will be assumed that the probable cost of the works has been determined to be $5,000. The capital stock is then fixed at this amount, and is divided into 500 shares at a par value of $100 each. It will be assumed that the canal is to carry 100 cubic feet of water per second of time. Under this assumption each proposed cubic foot of proposed capacity is represented by a capitalization of $500, and, as there are 500 shares, each of the latter would represent one-fifth of a cubic foot of water. If 1 cubic foot be considered as the amount required for 80 acres of land, each of those who desires to irrigate this area should snbscribe for five shares of stock, and for larger areas in the same proportion. These would, however, be no condition specifying the number of shares which any purchaser must acquire, though it would be advisable that each landholder purchase the number necessary to accomplish the satisfactory irrigation of the area proposed to be cultivated, since the number of shares held will determine the amount of water which he will receive. Each land-owner or other person desiring water shares now enters.

his name upon the snbscription or stock book of the association, and the secretary enters opposite thereto the number of shares for which he has subscribed, opening at the same time an account with the subscriber, upon which he is charged with the value of the stock contracted for, and given credit, under the proper dates, for any payments made thereon.

While it is generally a fact that a majority of the holders of stock in these concerns are actual farmers who propose to live upon and themselves farm the land to which the water thus acquired is to be applied, this is not a necessary requirement, and frequently a number subscribe for stock who do not own any land, but acquire the water either with the intention of selling it to others or because they intend subsequently to acquire land to which it may be applied. There are others, still, who, while owning land capable of irrigation from the proposed system, do not subscribe, because they do not intend to farm the land, but expect to sell it at an advanced figure, after the works are in operation, to those who already own or may subsequently acquire stock, either from the company direct or from other stockholder who may, for any reason, desire to reduce their holdings.

Each subscriber now becomes nominally a stockholder, though certificates of stock may never be issued, and he may proceed to work in the construction of the plant at a price for labor which has been fixed and scheduled by the board of directors, which, through the president of the association, has appointed a foreman and timekeeper to supervise the details of the work and keep the time of the operators engaged thereon. At the end of each month the foreman or timekeeper turns in to the secretary a statement setting forth the amount and value of the work contributed by each subscriber, and these amounts are by the secretary credited upon the accounts of the several stockholders in partial liquidation of their indebtedness to the association, incurred through the purchase of stock.

When the construction of the plant has been completed, the various accounts are made out and certificates of paid-up stock are issued to those who are found to have worked out the full amount due therefor. Those who are found not to have contributed the amount of work necessary to liquidate their indebtedness are given credits representing the amounts paid, and their accounts remain charged with the balance yet due, the adjustment of which may be required in the form of a cash payment, or may be permitted to stand on the books until an opportunity arises for working it out at a future date. Where stockholders at the completion of the construction have contributed work in excess of their stock subscriptions, the amount thus overpaid may be refunded in cash or allowed to stand as a credit

upon the books of the association and subsequently applied in liquidation of assessment liabilities arising through expenditures incident to operation and maintenance of the plant.

If it should be found, upon the completion of the works, that the expense of construction was less than the amount realized through the sale of stock, the difference may be distributed to the stockholders in the form of a dividend, to each in proportion to the amount of his stock, or it may be permitted to remain in the treasury and applied to the liquidation of subsequent indebtedness incurred in operation and maintenance. It more frequently occurs, however, that the actual cost of the works exceeds the estimate upon which the capitalization was based, and that additional funds are required to complete the enterprise. These may be realized by the levy of the pro-rata assessment upon the outstanding stock, or through the issue and sale of additional stock to the amount required. The general method of organization and procedure is similar in the case of unincorporated community associations.

When the works have been completed and actual operations inaugurated, certain expenses incident thereto are encountered. These consist, in the main, of salaries and expenses of officers, wages of ditch riders or patrolmen, repairs necessary to structures, and other incidental expenditures that need not be enumerated in detail. These liabilities are usually provided for pro-rata assessments against the stockholders.

As noted above, the essential features of this kind of stock irrigation company and of the unincorporated community canal are not dissimilar. The works of both are created, owned and operated by local capital and labor, and their inception and organization are brought about by similar causes and carried out along similar lines. Both depend for their success largely upon local ownership, economical management, and the lack of necessity for any great cash outlay in their construction and operation. Communities with little capital except pluck and muscle have, under these methods, created canal systems that are among the best and most successful in the whole arid region, and which, from modest beginnings, have ultimately resulted in the growing up of thriving towns and populous and prosperous farming districts under them. This is the system of construction and management common in Utah under the operation of the district irrigation law formerly in effect in that state. The districts formed under this law are in effect voluntary mutual associations or companies for the purpose of construction and operation of canals, the cost of which is raised by assessments on the various owners in proportion to their respective interests in the works and quantity of water used by them.

The farmers in many localities are prejudiced against stock corporations and prefer to operate their canals under mutual agreement. In Wyoming, for example, it is doubtful if one in fifty of the community ditches are incorporated. As trouble sometimes arises in regard to collection of assessments, a law has been enacted in that state the object of which is to compel the payment of such assessments in case of unincorporated community canals. The same aversion to corporations in connection with irrigation is noticeable in greater or less degree in the other states.

Although opportunities for participation in the development of new enterprises under the community system still exist throughout many parts of the arid region, they are becoming more rare with the advance of time. This is particularly true with reference to those localities in convenient proximity to the more important towns and cities, where lands and water rights under such organizations can now generally be acquired only through purchase.

THE CORPORATION CANAL.

Throughout all parts of the arid region there are found areas of superior land in the form of high plateaus or mesas, located sometimes at considerable distances from the more important streams, usually occupying positions of great evolution above the latter, and frequently separated therefrom by high rocky bluffs or ranges of hills and mountains. The exceptional fertility of many of these lands, together with their wonderful uniformity of surface, render them especially attractive to the irrigator. They are the best lands, but their location is frequently such that to secure the proper elevation dams have to be built to raise the water at the head, and the canal must wind its way for many miles through rock canyons and along precipitous cliffs, and be carried across ravines and chasms in pipes or flumes, whose design and construction require the best engineering talent and experience. The expense thus incident to the construction of the works is frequently so great that neither the individual nor the community can successfully undertake its execution; hence they await the coming of national aid. The agency through which many of these comprehensive, difficult, and expensive works of irrigation have been accomplished is the institution known as the land and irrigation corporation, which has been the successor to the individual community enterprises in the development of the agricultural resources of the arid West. The latter successfully held the field so long as the propositions open to consideration were simple, inexpensive, and readily available. In the development of these they proved to be admirably adapted to the requirements of the situation, but as the simple problems were solved first, operations became more difficult and expensive with the increasing magnitude

and complexity of undertakings, and finally a point was reached where progress must cease unless the assistance of some more powerful factor could be enlisted which might successfully grapple with the greater issues presented.

It was at this juncture that the irrigation corporation came to the rescue, and it has since become a prime factor in the development of the agricultural resources of the arid region. The individual and community efforts, however, have paved the way for the new departure, and the substantial results achieved by them made it possible for this powerful agency to become a factor in the work. It was their successful efforts that had first subdued the implacable desert and demonstrated the fertility of its lands and the possibility of creating prosperous agricultural homes and communities in a land which had long been regarded as a suitable dwelling place for only the buffalo, the coyote, and the Indian. These pioneers had demonstrated that the so-called desert lands of the arid region, whose acquisition from the Government could be accomplished practicaliy without cost, assumed a value under the practice of irrigation equal to that of the very choicest farming regions of the Eastern and Middle States, and the uniform success which crowned their efforts in this field attracted the attention of capitalists to these enterprises as presenting unusual opportunitids for profitable investment.

Under the individual and community régimes the prime incentive was the transformation of certain desert lands in productive farms, which were to serve as the permanent homes of the individuals who inaugurated and executed this work of reclamation, and they expected their profits through the actual farming of the lands so reclaimed.

(To be continued).

THE DIVERSIFIED FARM.

A TRAVELER'S GIFT TO THE FARMERS OF AMERICA.

One of the most remarkable collections of rare economic plants and seeds is now being worked up by the department of agriculture. Mr. Barbour Lathrop of Chicago, with Mr. David G. Fairchild as assistant recently completed a tour of the world, covering a period of two years and embracing travels which amounted to explorations. Mr. Lathrop has given the results of the expedition, undertaken at his own expense, to the farmers of the United States through the medium of the section of seed and plant introduction of the department of agriculture.

The expedition left New York Dec. 31st 1898, and returned last fall, having visited in order the following countries and sent in from each, living economic plants and seeds for cultivation by American farmers and horticulturists: Jamaica, Grenada, Barbadoes, Trinidad, in the West Indies; Venezuela, Colombia, Ecuador, Peru, Chili, Argentine, Brazil in South America; Portugal, Tyrol and Bohemia in Austro-Hungary, Italy, Egypt, Amboina, Banda, Lombok Bali, Moluccas, Aru and Kei Islands, Tenimber archipelago and New Guinea in the Dutch East Indies; Hong Kong, Canton in South China; the Philippine Islands; Bankok, Siam; and Sweden and Finland in northern Europe. Many thousands of dollars have been spent by Mr. Lathrop upon this expedition and he has put into it some of the best thought of a practical man who is alive to the general wants of his countrymen. He is not an agriculturist and entrusted the technical part of the work to his assistant, Mr. Fairchild, who was detailed by Secretary Wilson from his position as chief of the section of seeds and plant introduction. The dangers of such a trip into malarial-infested regions will be evident to old travelers, and is a matter of deep regret to Mr. Lathrop's friends that the Caracas fever so seriously affected his health that two visits to Carlsbad were necessary, while the botanist of the expedition was laid up with malaria in the Moluccas and with typhoid in Stam and Ceylon. Notwithstanding these serious drawbacks the expedition has been brought to a successful conclusion and the farmers of this country should be made acquainted with this valuable gift which Mr. Lathrop has patriotically but modestly made to his country.

The trip was primarily planned to be one of reconnaisance. The object in the first place was to find out what each country offered in inducements for exploration work, how it should be entered and studied, whom of its inhabitants could be relied upon as correspondents and what would be the probable expense of an exhaustive study from the standpoint of plant introduction. This object has been attained and is embodied in a mass of notes and piles of publications and note books.

The secondary aim of the expedition was to purchase and import for trial such promising seeds and plants as were suited for culture in various parts of the United States. The material thus purchased has not all come in yet but the main part has been distributed or will shortly be sent out by the department to the various ex-

periment stations and private experimentors for trial and report. Over four hundred and fifty different purchases were sent in from the various countries, each purchase accompanied by careful notes on its culture and the climatic soil conditions to which the plant or seed was best adapted. The noted list has been in part published or is in progress of publication by the section of seed and plant introduction. It covers a wide range of horticultural plants suited to variety of conditions from the tropical surroundings of Porto Rico and Hawaii to the Artic climate of Alaska.

Although it is premature at this early day to predict the fate of these introduced plants it will be of interest to point out some of their prospects and the reasons for their trial.

A spineless succulent cactus of the Argentine suitable for fodder purposes in the desert regions of Arizona.

A series of West Indian yams of which at least one is superior in flavor to the Irish potato. Suitable for culture in Florida and Louisiana but demanding special care and a special market.

The Alexandrian clover from Egypt,—a late fodder crop for irrigated lands in southern California and Arizona. This is the principal fodder crop of Egypt.

Some of the finest varieties of Bohemian hops to replace the culture of inferior sorts now almost exclusively grown in America.

Varieties of "pedigreed" barleys originated in Sweden and of superior value for brewing purposes. Varieties which took 20 out of 28 prizes at the Swedish brewers' exposition.

Fine West Indian manges and superior sorts of East Indian bananas for culture in Porto Rico.

An evergreen poplar from Chili for the Pacific slope.

A frost hardy aligator pear for the coming industry of this fruit growing in Florida and California.

The Lapland six-rowed barley and the early ripening finish black oat for experiments in Alaska and such short season regions.

Chilian alfalfa varieties for breeding experiments on this most remarkable of all fodder plants.

Several novel Swedish leguminous (clover-like) fodder plants lately brought to the notice of the agricultural public of Sweden.

A Bohemian horse radish, superior in size and flavor to any American sort.

The "Jannovitch" Egyptian cotton which is now being tested by over one thousand experimentors in the upland cotton regions of the south and regarding which many encouraging reports have been received. It is a stronger grower and has a much longer staple than any American upland cotton. It also has proven resistant to "root rot" of cotton to a very great degree which will make its culture possible on lands previously totally unfitted for cotton growing.

The "Algarobillo" a tannin producing shrub from the Chilian deserts with most remarkable desert resisting characteristics and large tannin producing capacity for Arizona conditions.

A fodder bamboo for the arid regions of the Southwest which forms in South Chili one of the principal sources of fodder for large herds of cattle.

A variety of onion from the islands of the Nile which is pronounced by our expert onion growers, the best pickle ever grown.

"Zuccini" from northern Italy. One of the most important vegetables of the Venetians and worthy serious consideration by our truck growers.

The seedless Sultanina grape from Padua, Italy, for the seedless raisin industry of the Colorado desert region.

This list might be largely extended and were it possible to collate the ass c

ports upon the various things already distributed it is certain several other most important things would need to be added. Of course, the value of most of the arborescent plants can only be decided after several years of culture and the fate of many of the annuals only after numerous repeated trials.

In addition to the four hundred and more products secured and shipped, many important plants were learned of, but not secured. Quantities of important tropical fruit varieties for Porto Rico and Hawaii are on the books of the expedition and wait only for suitable experiment conditions on those islands. A seedless Siamese grape fruit was ferreted out but owing to the unhealthiness of the country, not securable. This one variety it is predicted, would if introduced, like the seedless Bahia naval prange, revolutionize the grape fruit industry.

Enough has been cited to show the American farmers what has been accomplished by private means, and in how great a measure their thanks are due to the true American who, with neither land of his own nor agricultural interests in his charge, has put at their disposition his money and time and health.

The great results likely to come from Mr. Lathrop's explorations will be due to his wisdom in associating with him expert botanists and scientists and securing the most complete data and information concerning the new and strange plants secured, relating to their habits of growth and the character of their natural surroundings, thus enabling the department of agriculture to intelligently experiment with them. There is in the broad area of the United States somewhere, a spot which is a counterpart of almost every region of the eastern hemisphere, but it is a work of great magnitude to fit the plants of the older country to their congenial spots on this hemisphere. This is one of the most important lines of work which is being carried on by the department of agriculture.

FARM NOTES.

A novel way of booming farm lands is credited by the *Philadelphia Record* to the general passenger agent of the Atchinson, Topeka & Santa Fe R. R. He has had traveling about the West an expert shorthand writer to visit individual farmers in their homes, find out what success had been met with and then write letters at their dictation, addressed to eastern friends, telling all about the big crops and resultant good times. This private secretary goes about with a team and carries a small typewriting machine and stationery. He interviews the owner or renter of each quarter section on his route and writes down the industrial situation as it really is in that neighborhood. He tells just what luck was had with wheat, cattle and hogs, describes climatic conditions, mentions Mary and the baby, and sometimes winds up the story of a lifted mortgage and money in the bank. This personal correspondence is followed up at the head offices of the road by mailing appropriate advertising literature to the farmer's friends. Beneficial results are said to be already manifest to the railroad. When a person living back in Ohio receives a letter from his former neighbor written on a typewriter, he naturally concludes that any country which is prosperous enough to warrant a plain farmer owing his own writing machine is worth investigation.

The department of agriculture has addressed inquiries to over 16,000 peach growers in the United States, the great majority of whom have replied that "peach-curl-leaf may be prevented with an ease, certainty and cheapness rarely attained in the treatment of any serious diseases of plants, and there is no longer a necessity for the losses annually sustained from it in the United States." The rem-

edy is spraying with winter strength of Bordeaux mixture when the buds begin to swell.

A government report states that the horses of our cavalry and artillery branches of the army in the Philippines would not feed on their hay rations, and become very weak. They were given one part of cheap brown sugar or molasses to every eight parts of hay, and soon recovered.

Dr. Harvey W. Wiley, the chief chemist of the department of agriculture, is preparing a report covering the work done by his office during the year and outlining the work for 1901.

"The utilization of the stalks of Indian corn is one of the subjects," said Dr. Wiley, "to which we have given some attention. The subject affords more field for study and has more possibilities than might at first be supposed:

"The possibility of utilizing the stalks of Indian corn as a cattle food has long occupied the attention of our agricultural chemists. A large amount of experimental and analytical work has been done in this direction by the experiment stations, notably by those of Maryland and Pennsylvania. Our work has been directed chiefly to the study of the rations composed of the fine ground stalks of maize mixed with blood, molasses, ground bone, Indian corn meal, other cereal products, and various other ingredients.

"The previous grinding of the stalk is a primary necessity, since otherwise it can not be properly masticated. When convenient, it is also advisable to remove the pith, which can be used to better advantage for other industrial applications.

"The ground stalk has a nutritive value equal to that of coarse hay and absorbent power for blood, molasses and other liquids which makes it an ideal vehicle for offering these bodies in an appropriate form for consumption to domesticated animals. The value of both blood and molasses as cattle foods has long been established, but until the employment of fine ground Indian corn stalks as an absorbent was proposed no entirely satifactory method of utilizing these products was known.

"During the past year many different corn stalk rations have been mixed and subjected to analytical study, with the result of showing both high nutritive properties and so adaptability to particular purposes. This may be illustrated by citing some of the particular rations which have been prepared, viz., the rations for the maintenance of horses and cattle not being fattened; rations for animals at hard work; rations for fattening animals; rations for poultry, both for egg production and for preparing poultry for market. Various forms of rations for each particular purpose were prepared with the object of securing the best balanced and also the most economic product.

"Our experiments demonstrated beyond a doubt that fiue ground maize stalks are by far the best material known for utilizing blood and molasses as animal foods. Although cattle foods are now very cheap and abundant in our country, it is somewhat interesting to know that in the almost inexhaustible quantity of this material we have a resource for the future which will supply every demand. In this material also we find a means of utilizing in the most economical way the waste products of the slaughterhouses, of our beet sugar factories, and of the cane sugar factories of Louisiana, of the Hawaiian Islands, and of our tropical dependencies.

"Another subject which may be considered of general interest is the chemical examination which the department is making of foreign food products. We wish to keep a high reputation for American exports and we desire to send abroad only those food products which are wholesome and free from adulteration. In like manner we ask that similar products sent to us from foreign countries be true to

name and label and free from adulteration and injurious ingredients. To this end an extensive study of such imported products has been authorized by congress and has been rigorously prosecuted during the year. The results of these studies have been in a measure confidential, and instead of being published have been transmitted to the secretary of agriculture for his guidance in discharging the duties imposed upon him by the act of congress authorizing the investigation.

"The extension of this investigation to all imported food product will undoubtedly prove of the greatest advantage to our people, since it will result in the exclusion of harmful and adulterated articles and of those which are sold under a false and misleading name of labels. In securing these samples, we have had the active co-operation of the secretary of the treasury and of the officials of the custom house at the more important ports of entry."

The *Chicago Tribune* comments on a musical folly announced by a German scientist. He has discovered that plants are sensitive to music and that some plants unfold their leaves and are stimulated to growth when sweet music is made, while they close them again if the music becomes discordant. The *Tribune* thinks well of the discovery and suggests that a brass band might be usefully employed in forcing the products of a truck farm, while a mandolin orchestra could be used to stimulate a flower garden.

During the past year the weather bureau has furnished daily weather forecasts in 11,621 cases, most of them to farmers. Mr. Willis Moore the chief of the bureau believes that no class of people better appreciate these forecasts than those living in agricultural communities. Farmers who are provided with rural free delivery and desire to receive these forecasts should request the same from the Secretary of Agriculture, Washington, D. C.

In his annual recommendation to congress, the director of the office of Experiment Stations urges the establishment of an experiment station in Porto Rico (in the vicinity of San Juan) on the usual lines of such institutions except that information may be disseminated through both the English and Spanish languages. Secretary Wilson seems to think that congress will so provide.

The entomologist of the department of agriculture is endeavoring to improve in living condition certain European tree-inhabiting predatory beetles for use against the Tussock moth caterpiller in the United States, and especially against larva of the gipsy moth. The lapse of appropriations by the state of Massachusetts against this last named insect and its possible great increase and spread renders the introduction of its European natural enemies very desirable. The bug scientists state that if allowed its own sweet will, the gypsy moth would spread over the entire country.

A visit to Dr. Victor A. Norgaard, Chief of the Pathological Division of the Bureau of Animal Industry of the Agricultural Department, found him carefully perusing some statistics which had been compiled on the disease of black-leg among cattle.

"The action of Congress last session in making an increase in the appropriation for the distribution of black-leg serum," he said after a few moments reflection, "practically settled the controversy between the drug firms and the Department. During the past year we sent out over 2,000,000 doses and the results, so far as we have been able to learn, are more than satisfactory. Of a total of 430,000 head of cattle which had not been inoculuted with the serum, the annual loss was something over 13 per cent. and last year an examination by our assistants revealed a loss of 16,000 or nearly 4 per cent of the entire number. But since the dis-

tribution the decrease in the mortality has been very marked. Our records show about 2,500 deaths from black-leg or a resultant three-fifths of one per cent. of the total amount. That the farmer is benefited by our work there is not a doubt. Of course this is not the only important work which we are doing, but I have called attention to black-leg because it is one of the most serious obstacles with which the agriculturist has to contend. The loss from this source is more than from all other causes,—disease, accidents, etc."

When asked about what has been done toward relieving cows from the attack of flies, Dr. Norgard said: "There are many remedies, both from private sources and our own, with which to keep flies off of cows, but none of these are lasting, continued application being necessary. Now the horn fly is very troublesome to many cows and fish oil is extensively used. It is applied to the frontal bone and head of the animal. It is sticky and only has a lasting effect for a short time. Two of the most prominent sheep dips on the market used at a strength of about 2 per cent. are known to be beneficial. Then different coal-tar preparations,—kerosene, a solution from juniper and cockle-berries and numerous other concoctions may be of some benefit, but when their strength begins to weaken, the flies continue to annoy the cows and can only be kept away by renewal of the remedy. Trouble from the cause is not so serious, however, for whatever loss in milk or weight is occasioned by the attacks of the flies, the coming winter will see a corresponding gain."

European dairymen buy large quantities of American feeding stuffs. Experiments are now being made in compressing bran into bricks for more convenient exportation. While the success of this line of work might lead to a still greater exportation of American raw farm products, the failure of the experiment would be America's gain. Bran is one of the most valuable feeds for the dairy. It is recommended by many feeders as especially useful for feeding in conjunction with corn-meal which is concentrated and tends to "pack" in the stomach. Bran is cooling and can be used in almost any reasonable quantity. It is a food rich in protein and contains a large amount of the nitrogenous element of fertility in soils. What is known to be extremely hard on soil and the chemist has found that most of the soil strength goes into the bran. Broadly speaking, therefore, the extreme folly can be seen of exporting bran and letting that much fertility go out of the country to enrich foreign lands, necessitating the purchase, in lieu thereof, of artificial fertilizers of all kinds to keep up our fertility of soil.

Mr. Herbert J. Webber of the Department of Agriculture is now in the South making experiments in the hybridization of cotton. About a year ago the Department sent out several thousand pounds of seeds to different parts of the cotton growing States. These seeds were of Egyptian and sea island species and from the reports now being received, these plants are growing very well and the officials are much encouraged in their work. Mr. Webber is superintending the hybridizing of cotton which will produce a long, firm staple.

Every year there is about $20,000,000 of Egyptian cotton imported into this country. The cotton-growers cannot compete with this variety of cotton, but if the experiments prove successful the farmers will be able to raise hybrid cotton which will equal the staple from Egypt. The department is of the opinion that this new variety can be grown in all parts and will prove a boon to the important commodity of the South.

In many portions of the South there is a peculiar fungi in the soil which attacks the roots of cotton and its work is so complete

that it cuts off the water supply from the plant. This disease is knowh as "wilt" and in Charleston, S. C., has been growing rapidly. The Department has found several species which will resist the attacks of this destructive pest and its work along this line through Mr. Webber will be the hybridization of these with plants more liable to be destroyed by "wilt."

A manufacturing company in the United States recently made inquiries of the State Department regarding the use of harvesting machinery in India, in cutting grass and grain. India is not a hay-producing country, writes Consul-General Patterson from Calcutta. The grass is cut and used green for horses, but is not cured as hay. The common fodder for cattle is rice straw. In the vicinity of Bengal, rice and jute are the principal crops, and the quantity of grass grown is extensively grown in the western part of India for which Bombay is the principal shipping port.

A colony of vegetarians are living on Tagula Island, a tiny bit of land in the Dutch archipelago, about 700 miles southeast from New Guinea and 1,000 miles northeast from Australia. Under the leadership of a Methodist clergyman, the Rev. James Newlin of Ohio, some seventy people sailed from San Francisco in 1890 for Hawaii. They believed that a higher plane of Christianity was to be reached by a vegetarian diet and freedom from contamination with degenerate mankind. So they gave up their friends and homes in the eastern states. Tagula Island was fiually chosen for their colony, and the fifty good natured natives there welcomed the new comers. There have since been accessions to the colony of people from England, Australia, and America.

Time and time again has the question of docking the tails of horses been discussed and always humanity comes out on top.

All the driving horses in Russia have long tails and the coachman of an ordinary Russian carriage takes no trouble to prevent the reins from dropping about his horse's hind quarters. In spite of this, however, the reins rarely become entangled with the tail, and even if they should do so the horses never kick. This striking fact is an eloquent answer to those who uphold the cruel practice of docking, on the grounds that otherwise the horse is liable to flap his tail over the reins.

PULSE OF IRRIGATION.

EDITORIAL COMMENTS.

If these floods could be stored and released gradually as required for purposes of irrigation, these dry and barren areas might be rendered as highly productive as the land now under cultivation, whose products are the wonder and admiration of the world. The people of this state should get behind the movement to have the general government adopt the motto of "Save the Forests and Store the Floods," and should demand of their representatives in both houses of congress active support for measures designed to put it into effect.—*San Jose (Cal.) Mercury.*

In the nature of things the construction and maintenance of irrigation works are public functions like the building of lighthouses or public highways, and the former can as ill be made objects of commercial enterprise as the latter. There is water sufficient for the irrigation of from 75,000,000 to 100,000,000 acres depending upon the methods of conservation employed. Probably 10,000,000 people could find homes on farms and be self supporting if the water supply should be properly regulated. A better investment was never made by a government since the world began.—*Philadelphia Record.*

The problem that will confront congress is what methods and measures of legislation will open and develop the resources of the arid region, which comprise millions of acres of fertile lands that are now wastes for want of fructifying waters that can be utilized.—*Dallas News.*

The meaning of the enterprise is one that ought to enlist enthusiasm. It means peace and prosperous homes, good citizenship and a very appreciable addition to our national wealth. It means actual expansion from within. It means life to a vast section that is now dead and deserted. Some may feel that the enterprise is not one of national concern. It is the nation's business to strengthen the nation, and this can be done quite as surely by development from within as by extension from without.—*Boston Transcript.*

We have an arid area in our great West large enough to give every poor man in the United States a comfortable little home if only such lands were rendered habitable and productive by irrigation. Just now when the nation is taking so much of "expansion," and the people have seemingly endorsed the proposition that we need "more territory," it ought to be comparatively easy to arouse national action to acquire thousands of square miles of practically "new territory."—*Houston Post.*

Irrigation has long since passed beyond the experiment stage. It has even reached the point where little can be done by private capital. Yet vast areas of the public domain remain unclaimed in localities where land would have a high value if an artificial water supply were assured the year round. Without storage reservoirs they would be barren and useless indefinitely, but once irrigation becomes possible they will be quickly settled and will support a much larger population than the same number of acres of land maintained

in regions where normal rainfall prevails. —*Philadelphia North American.*

The West is a unit in desiring the reclamation of its arid lands. Appropriations for this purpose are demanded not only by reason of the obligation of the nation to improve its property, but as an offset to the great sums contributed by the arid interior for the improvement of the rivers and harbors of the rest of the country. The work of the National Irrigation Association has been mainly a propaganda among the merchants and manufactures of the East for the purpose of arousing them to the importance of opening new markets by irrigation. This propaganda has been remarkably successful.—*San Francisco Chronicle.*

The people of the arid region who understand the irrigation problem desire national appropriations to be confined to the construction of storage reservoirs, and, in a very few cases, to long and expensive canals, the construction of which is beyond the ability of private or state enterprise. If the reclamation of the arid region makes homes for 10,000,000 people it will more than justify all the expense involved. —*Denver Republican.*

The advocates of Federal aid to irrigation declare that the scientific storing and distribution of water would so regulate the amount which finds its way to the rivers as to make extreme fluctuations almost unknown. Wing dams, levees and riprap would not be destroyed, channels would not be suddenly choked with sand, and thus millions would be saved. The argument is an interesting one, and there are others in support of irrigation under government control that are even more forcible.—*Minneapolis Times.*

What the nation is asked to do for the arid lands of the West is just what the nation has been doing for almost a century for the low-lying bottom lands of the lower Mississippi, and that is, to construct such works for the government of the water of the country as will render the land habitable and tillable.—*Albuquerque (N. M.) Journal Democrat.*

The question of irrigation has passed beyond the experiment stage, and both theory and practice have demonstrated the necessity of the reclamation of the vast quantities of arid land now neglected, which, as was once said about Australia, will, "if tickled with a straw, be taught to laugh a harvest"—the straw in this case being water.—E. A. Hitchcock, Secretary of the Interior in *Annual Report for 1900.*

The great scramble for farm lands reported from Minnesota in the White Earth reservation, including only four townships lately ceded for occupation by white settlers, certainly indicates that the reclaiming of land by irrigation would be a popular measure of government. More than 2,000 people joined in the rush to secure homes, and for days hundreds of men waited at the door of the land office to buy homes at $1.25 per acre. These are genuine home seekers.—*Youngstown (O.) Vindicator.*

Under government supervision and control irrigation will make a garden land out of what has been called a desert, and the entire community will share in the great benefits.—*Minneapolis Progress.*

In calling attention to the National Irrigation Congress, the president of the Pennsylvania State College refers to "the planting on the soil of a great population with the employments and habits of rural life, and yet so compactly settled as to be able to secure the advantages in the way of schools, colleges, churches, entertainments and all that goes to make up the best social and public life which can commonly be secured only in the largest towns.—*New York Journal of Commerce.*

Captain Chittenden of the Engineering Department of the Government asserts that there are 75,000,000 acres that might be made highly profitable agricultural lands at a cost of $2.00 an acre. It is probable that in the near future the government will take the matter up. It certainly seems worth while.—*Kansas City World.*

Ordinary business sense demands that the federal government take up the work of irrigation. National irrigation enterprise would be beneficial in more ways than one. It would be profitable to the government because it would enhance the value of government land. It would provide an immense amount of work for men anxious to earn fair wages. It would build up a great section of the country that would be a splendid market for American manufacturers. Government neglect of irrigation is criminal—*Omaha World-Herald.*

It is eminently wise and proper that the national government should do its part in creating proper storage reservoirs and proper means for distributing water. The national government should, in my judgment, do its part, for here in the West the next great stride must be made by means of irrigation.—Gov. Roosevelt in speech at Salt Lake, Sept. 21, 1900.

A national system of irrigation and forest protection will be a gigantic proposition, and can be handled with success alone by the national government. Like the deepening of the waterway channels, the building of lighthouses and government locks for the immediate benefit of a few, but for the ultimate benefit of all, the establishment of a system of irrigation to bring under cultivation the vast arid tracts of the West, is also an enterprise within the peculiar province of the central government.—*St. Paul Globe.*

It is the experience of the whole West that companies that sell water rights are not successful; but the farmers' canal companies, where the men who own the land they irrigate also own the water system, have been successful. The right to the use of water for irrigation should vest in the user and become appurtenant to the land irrigated, the theory being that the water necessary to irrigate an acre of land should belong to the acre of land itself.—George H. Maxwell.

The construction of storage reservoirs is no longer looked upon as a scheme to loot the national treasury, but as a proposition which bears the same relation to the nation as the improvement of rivers and harbors, the construction of the Nicaragua Canal, the building of the Pacific roads and the laying of ocean cables. There is no more certain method of promoting commerce, domestic and interstate, as well as foreign and international, than by building up and promoting the industries of all portions of the nation.—*Denver News.*

The country cannot afford to permit the monopoly of the flowing streams. In many western localities growers are dependent upon those who by prior water right control the water supply. It is time our statesmen were listening to the vast and important new issues coming up.—*Racine (Wis.) Journal.*

The most interesting argument advanced at the recent irrigation convention is that the controlling of water sources for irrigation purposes which prevent the great floods which annually destroy river improvements, and that thus federal investment in irrigation reservoirs would be federal economy.—*Seattle Times.*

As the scheme of irrigation like that of transportation covers many states, it properly belongs to the federal government. Here is a million square miles of territory lying wholly untouched for the want of moisture. When we remember the fact that less than 500,000 square miles of

arable land produce all our grain, hay, cotton, sugar and vegetables, the importance of the reclaiming of this vast territory appears in its true light.—*St. Paul Globe.*

The systematic irrigation, through government appropriations of the arid West would mean a greater advantage to New England, beyond a doubt, than any other measure of national legislation which is likely to be adopted.—Boston Dispatch to *New York Mail and Express.*

The reclamation of one hundred million acres of arid land capable of supporting 50,000,000 inhabitants has become a national issue, and it is believed will be settled by the present administration, which is pledged to this end by its party platform.—*Columbus (O.) Dispatch.*

The East is much interested in a general reclamation of arid western lands. There is just as much argument to be advanced in favor of national irrigation in the West as there was in favor of national control and improvement of rivers and harbors.—*New York News.*

There are many manufactures in Massachusetts, for instance, whose prosperity and that of those dependent upon them depend very largely upon the western markets. They see clearly enough the relation of the reclamation of the West to the business interests of the East.—*Brooklyn Citizen.*

Fortunately for us we still have a domain of almost illimitable extent which is capable of supporting a population as large in itself as that we have at present, once water is brought to it. Water is all that is needed to make the now arid West the garden of the world. The time has now come when this matter demands the country's earnest attention. — *Chicago Journal.*

One of the greatest physical and economic problems that today is attracting the attention of the people of the United States, is the reclamation of arid lands. Nor is there another problem, the solution of which will bring about such far-reaching and beneficial results. Now that the presidential question has been disposed of, the problem of reclamation of arid lands by the government and for the people will be in order.—*Buffalo (N. Y.) Enquirer.*

Much misinformation exists in the East regarding the national irrigation movement, and some eastern agricultural papers even go so far as to oppose the whole thing, fearing that it will mean an increase of western competition. On the contrary, the peopling of the now arid region would furnish a home market for vast quantities of eastern manufacturers, and would produce comparatively little surplus farm crops for shipment to the East.—*Orange Judd Farmer*

The reclamation of the arid lands will furnish comfortable homes for teeming myriads of people. Their settlement will furnish traffic for the railroads and a market for endless quantities of manufactured articles while the surplus products of the field will be sent to the remotest markets of the world. The problem is certainly important enough to command general attention.—*Chicago Post.*

Irrigation is a subject about which Americans should be concerned. There is no movement which could do so much for the United States as the irrigation of the arid plains. The *Journal* hopes that an effort will be turned in that direction. There is no work which could so certainly add to the wealth of the nation. In the center of the continent lies the grandest possibilities of the nation. — *Lafayette (Ind.) Journal.*

When the government has done its duty toward that (western) portion of the continent, the cities of the Pacific coast will soon be larger and more magnificent than

the cities of the Atlantic coast. California alone will have some day thirty millions of people, and that day will dawn in the new century if the government will but act the part of of a shrewd landlord on the Pacific coast.—*Chicago Chronicle.*

There is no doubt that vast areas of land can be reclaimed by irrigation. What congress has to guard against is schemes to benefit mere private enterprise at public expense. The government should control the distribution and settlement of the land reclaimed, to permit its people everywhere to share in the advantages to be provided. A project so guarded will be beneficent, and the people of every section of the country can consistently approve of it.—*Springfield (Ill.) Register.*

Any great improvement that will benefit not only the territory adjacent but the whole country should be made. The Isthmian canal would do this, and therefore should be constructed. Of scarcely less importance is the proposed plan to reclaim the vast extent of the arid lands of the West. The fact that vice president elect Roosevelt, Gen. Miles and other prominent officials of the government are in favor of the great improvement, must be encouraging.—*Cleveland (O.) World.*

The government experts have surveyed the arid lands, measured the water supply and made estimates as to the cost of increasing or regulating the latter. All that congress is asked to do now is to make a beginning. It is believed that such success will follow the building of one storage reservoir that the advisability of others will never be questioned, and that they will thereafter be built whenever opportunity presents and the financial resources of the national government allow.—*New York Commercial Advertiser.*

When in his letter to the irrigation congress Gen. Miles said that private or corporate enterprise could not be trusted with the water monopoly in the arid regions of the West, he expressed a sentiment that will meet with a chorous of approval in every state and territory where irrigation is employed. There is work of great magnitude to be done which would be impossible to any other agency than the federal government. — *Chicago Times-Herald.*

It is probably true that the millions of acres of arid lands still existing, which might be made to blossom as the rose if water could be turned through them, must remain arid unless the national government takes some action. Enormous possibilities of material development are wrapped up in this question. There are sections of the country where one piece of land is worth $500 an acre, while land adjoining is not worth more than fifty cents; the difference being that one is irrigated and the other is not.—*Boston Journal.*

Tens of thousands of farmers settled upon small but highly productive farms would add greatly by their labors to the agricultural products of the United States, and would be new, good customers of its manufacturers and merchants. There is one reason why so many prominent Chicago business men are interested in this irrigation question. There is no doubt that any extensive plan for the reclamation of the arid lands can be carried on to much better advantage by the general government than by the states.—*Chicago Tribune.*

The problem of the arid land is one of the prettiest and most promising problems before the country. The government alone can secure the preservation of the forests of the West which are vital to the continuance of the water supply. It can control the water supply itself and this no private corporation can do. Irrigation is a matter demanding public supervision and control, and the national government alone is in a position of carrying on the work of promoting it. What concerns the

arid lands of the Rocky Mountain region concerns every part of the United States. —*Syracuse (N. Y.) Post-Standard.*

The government is spending large sums in aiding in the development of foreign trade and the opening of foreign markets for American manufacturers. It is believed that we should push our goods into every market of the world and sell them. The belief is also gaining ground that the government should develop its home market for its products and its manufacturers. This it could do by reclaiming the 75,000,000 acres of western arid land and settling them with thousands of industrious home builders. Eastern merchants are more than willing to see such an accomplishment.—*National Irrigation.*

Captain Chittenden's report puts the area that might be reclaimed at 75,000,000 acres. Here is size enough for an *imperium in imperio;* or, if the term offends, a republic within the the republic. The eastern overflow will need its outlet for population for many years to come, and it is that fact which makes this interesting proposition worthy of consideration in this section. There would be no great risk taken in the proposed expenditure, as gradually as it would have to be made, because the government could make its own terms and guard itself effectually against any ultimate loss by the outlay.—*Boston Transcript.*

The disadvantage of permitting the work of irrigation to be done by private corporations or syndicates is that the irrigation companies secure control of the water supply. Having done this, they forever afterward hold the key to the situation, and unless their plans are comprehensive, their construction work substantial, and their water rates reasonable —which conditions are seldom or never fully realized—they are a hindrance to the complete irrigation of the dependent locality. For these reasons the national government ought to take hold of the irrigation problem and work it out on a thorough and homogenous plan. The newly elected national administration and congress are fully committed to the policy of nationalizing the work of irrigation.—*Chicago Record.*

ODDS AND ENDS.

CHRISTMAS IN A RICH FAMILY.

MARIE CONRAD-RAMLO.

If the walls in the old city of Hamburg had been transparent or, at least, if people could have looked in at the windows—the general verdict of all the curious would have surely been, "the Kaunitz home, the house of the rich wholesale dealer, looks certainly the nicest. Fverything arranged so thoughtfully, in such a sweet way—in one word—incomparable!"

One would not at first sight have given credit to the little, insignificant looking Frau Kaunitz for so much inventive power, such capability to appreciate and utilize the humorous side of life and sbove all for the infallible taste and tact with which she arranged everything.

She did not copy the custom of most families, where a large table stands in the center of the room with a large Christmas tree upon it while under the glistening branches lie the presents in ugly, prosaical heaps as though they were on the counter of a store.

No, in this house, the entire place was like an immense Christmas table. Halls and stairway, every room, sometimes oven the stable was utilized for the placing of presents. The most precious gifts, however, were invariably hidden in the mother's boudoir—a room that led from the salon through a door curtained with rich and heavy draperies; this the children knew and waited with all-disguised impatience for the moment when the velvety portieres would be drawn aside and the long desired love-token of their mother would be found.

In this same way the Christmas tides of many years were greeted as long as the two children were at home.

Then all at once things changed, the house became silent. Amalie, the blond, pretty daughter, was betrothed to an immensely wealthy ship builder of America, while the son Bruno went to a celebrated college.

Longingly the mother sought for the expression of bliss in her daughter's face, for brimful eyes and quivering lips. She did not find it. With dry, questioning eyes the girl looked at her mother.

"Are you happy my child," wrs the tearful inquiry.

"I hope to become happy. I shall live like a queen. I shall possess all a human heart can desire and my betrothed loves me."

"Yes, yes, he loves you, he wil make life happy for you." But Frau Kaunitz knew that none of

the happiness had yet entered into the girl's heart. She had acccpted her suiter, because her father had wished her to do so, and she, the loving daughter, having no will of her own, was accustomed to be ruled by his victorious authority.

"Wealth is happiness," the father had said. "I wish to see my children rich—I want to see them great."

"I would rather see them happy," sighed the mother.

But should she influence her daughter against this marriage? No, she could not do it. For this union was the realization of one of her husband's most ardent desires! And Aamlie's intended husband truly loved her. That was the reason which silenced her above any other. "What bliss it must be to be loved!" It was more than she, Frau Kaunitz, could grasp. The little woman had a wide kind heart opening towards all the world. But the heart of her husband, the handsome stately Herr Kaun z, was small, narrow, Philistine. Now she was alone with him. Her deep, gray eyes, the only truly beautiful feature of her whole person, were often filled with tears.

"Great my son shall be, great and famous! Law shall be his profession, not painting nor music as he would have it. Law leads to everything. Therefore it is law. He shall be a Bismark or something on that order, for we possess the means to achieve it. Then he'll be knighted, later he'll marry a rich daughter of the nobiliiy and then, then——," Thus dreamt the merchant and the dreams made him happier. Frau Kounitz knew this and she allowed her son to leave.

To make people happy! That was always her desire. Only he who can make others happy may himself be truly happy. But Bruno, her cherished son, was not happy. What could she do? She thought and thought, all in vain.

There was no more Christmas joy in the luxurious mansion. Only the servants received the expected gifts and the city's children of the poor spoke of the "angel kindness of Frau Kaunitz." But her home was very quiet. To a holy child this day was consecrated and glorified for Him and, therefore, will Christmas be a holiday for the children for all time to come. Old people are only happy on this day if they witness the happiness of children.

Frau Kaunitz looked sadly around her in the quiet room where, in former years, the very air seemed saturated with christmas whisperings and the scent of fire and pine.

"Let Bruno remain at college. The few days short and frequent vacations are always hurtful. Mister student readily acquires the habits of idleness at home and we need no such sentimentalities anyway!" So spoke the father, and when had the "master's" energetic will not carried the day in this house?

And Amalie, although she often

wrote to her good mother explicit letters, never replied to the anxious question: "Are you happy now?"

Bruno thus studied jurisprudence. Aside from his studies he painted, played the piano, wrote poems and—failed in his examination. His father raged and raved: he thundered: "Bruno is a——."

"Good son" the mother interposed, and she was right.

"He——"

"He has a great heart."

Herr Kaunitz trembled with anger. "A son who fails has never a great heart, don't talk so ridiculous."

And yet the mother was right again.

"And he shall be great and famous in spite of it," the father snarled.

"Oh that he may be happy," whispered she. But the man did not hear.

"Never a painter nor a musician," he continued, "they are all poor devils. A merchant, yes, he may be that, if law won't go; then he can at least make money. And money is power, too. Millions make famous. When Bruno will have his millions—he hasn't got them yet—he can allow himself the luxury of daubing or thumping."

Thoroughly crushed Bruno entered his father's presence and with a painful shock he listened to this decision.

"Yes" he replied, "I will do your bidding; I owe you this obedience, for I brought disgrace on your name; I know my failure is a greater affliction to you than my death might have been."

He paused and waited for a reply, a refutation but heard only an undefinable grunt, and he went away.

He settled down to work in the office, day and night with untiring zeal, straining all of his faculties to their utmost. He wanted to gain his father's respect, for he possessed his mother's heart.

Herr Kaunitz could nurse the symptoms of his gout. Bruno took his place in many things. But the deed, the great redeeming deed, he still lacked, and at last his opportunity arrived. In the great Kaunitz store-houses in Kaiser Wilhelmsland in the South sea a rebellion had arisen, great embezzlements were discovered and quite a large part of the fortune was at stake.

The old man could not leave or he would have been the first to be on the scene. But the gout just then troubled him greatly and so he wailed:

"That requires a man of my experience, my energy, my courage! But I have no such person."

"I will go there father," said Bruno.

"You?" Herr Kaunitz grinned in an unbelieving almost derisive way, "you would be the last, whom I would credit with sufficient intelligence or courage"—Bruno blushed. "Enough, father, I shall go there."

And he he went, settled every-

thing, displaying great prudence and calmness and started on his homeward journey, though the fever had taken hold of him. Chills and heart were alternately shaking him and when home at last, he fell exhausted into his mother's arms, who saw his pallor with trembling fear.

"Why did you inflict this on me, Bruno?" She cried."

"Why did you leave?"

"To save for father a part of his fortune. Wealth is the only thing that can make him happy—I went with the secret hope, he, too, would some day—if I asked him—"

That was all. They were his last coherent words, after that there was only unintelligible murmuring, broken sentences and then his lips and eyes were closed as in death.

The mother sat at his bedside night and day and listened with breathless attention to everything, but she could find no connection, only now and then, the clearly pronounced name "Regina." She waited and wondered but nothing more came than: "Regina, Regina." Sometimes softly, lovingly, sometimes with a sigh and again in reproachful accents.

"Who is that? I know of no such person," thought she. "I have never heard of her."

And then she would lay her hand on Bruno's feverish brow. He took her hand and pressed it to his lips first, then to his breast. The mother prayed, lifted her right hand as one does with a vow and her face assuming an expression of heroic resolution seemed to be transfiguring into beauty.

Bruno recovered.

His mother asked him without any introduction whatsover:

"Do you love Regina?"

He looked into his mother's face with astonishment, but full of earnestness.

"I do, mother more than I can describe—as much as man can love a woman."

"Why did you never tell me of it?"

"Oh mother, you never can help things, anyhow."

He said it quietly and meant no harm, but the simple words struck his mother like an awful reproach. Never can help things! She bit her lips in humiliation. He continued: "And father—well you know his plans for my future. Wealthy, distinguished—immeasurably rich must be his daughter-in-law's portion! He would laugh as he has never laughed in his life before, if I should tell him how poor, how terribly poor, Regina is. Oh mother say no more of it, I beg of you—for she too, is so proud, incredibly proud. Her pride is as great as her love for me or I should have gone into the world long ago to make a living for her with my incomplete abilities."

"Why—she refuses?"

"Yes, she refuses to bear father's name against his will. And it would be dreadful for me to lead the wife of my heart to an uncertain fate. She, who has always lived on the dark side of life and battled with poverty and trouble.

I would make a soft, warm nest for her and I cannot."

He said no more; she also remained silent.

* * * * *

Regina's mother who lived at the city's farthest end did not wonder a little to see the rich Frau Kaunitz one day walk into her shabby home. But even more astonished was the rich woman when she met Regina, so beautiful, so prond, yet of such earnest mildness as a god-sent being, like one imagines the protecting angels of the little children to be.

It was hours before Frau Kaunitz walked with smiling lips the short distance from the little house to her carriage at the next corner. With decisive steps she entered her husband's room that day and actually heard, when she began her tale of Regina, the brutal, exaggerated laughter which Bruno had mentioned. Verily, never in his life before had Herr Kaunitz laughed like this.

But the woman kept on in a quiet, resolute manner, though her weak body shook with a wild tremor. She gathered all her strength unto her. With pale lips she told him, how, as a young bride she had cleaned his desk one day and had found a letter from her guardian, which plainly stated that the stately handsome Herr Kaunitz had sold himself to her, the little, sickly girl. She told him, that the sale passed through the hands of her unscrupulous guardian without her knowledge. She had thought that her wooer had loved her and she had not known that the stately, handsome Herr Kaunitz was a bankrupt, who only wished to marry the large money-bag of the small girl, but who, to his sorrow, was obliged to take the "little charmless invalid," whom he dreaded, into the bargain.

She had learned all this through the letter—which she now held in front of her husband's eyes—learned it all even in her honeymoon and thus she had become his silent, faithful, but joyless wife, till the children came. The little darlings had brought her happiness, so pure, so immense, and yet painful, for the father remained hard and rough even to them. Then her beloved daughter Amalie left her according to his wishes and she suffered her to go; then the son went and again she suffered his departure to place—she acquiesced every thing in slavish subjection, because she loved the man wildly, passionately, because her very breath, her entire life had been love, a wonderful love of the hate-worthy man from the beginning of her married life until now.

For his pleasure only were the affairs of the family arranged. Amalie, Bruno, and she, herself, sacrificed everything and did anything for his sake. For it was that which had, in spite of all, commanded the admiration of the little woman. The power of his indomitable will; the firmness with which he alone of all of them was endowed. Amalie and Bruno were his children in appearance by their

imposing statures, but they had also inherited a part of her nature, her lack of decision, her weak will—but also her magnamimous, childish heart.

Frau Kaunitz spoke long with her husband. He had never listened with such patience before. The heart of the stately man expandep as he listened, and it became larger, wider, softer. He wondered: Can a woman so love a man a whole life long, who does not love her, a man of whose degradation of soul she is convinced? He did not exprese this wonder, far from it, but he meditated upon it as one does on something incomprehensible, inconvincible, something abnormal.

* * * * *

And christmas returned once more.

"Let it pass quietly, mother," begged Bruno, "just like any other gray winter's day. It is only for children, and we have none."

The mother nodded, Bruno sighed deeply. He longed for a home of his own. Both, mother and son looked straight ahead into blankness and the eyes of both grew moist. A bright multicolored vision passed through their minds. A sweet, earnest wife among a crowd of laughing children. However, the mother only said:

"But at least be at home this evening, Bruno."

"Oh yes, you dear good, mother, I shall be with you."

Christmas surprises! It remained the little Frau Kaunitz's specialty after all.

She had to arrange for a few pleasant surprises for Bruno, even though she had bade him to desist. And once more there were christmas whisperings, a hurrying softly by, christmas odors and christmas glory all over the house as in olden days.

When Bruno, in coming home crossed the yard, Fritz, the little stable boy in full uniform, called him to the stalls.

There stood a beautiful riding horse of noble race, a present from his father. Bruno petted it, smiling, and assended the steps. There on the clothes-rack in the upper hall hung a fur top-coat for him.

"Ah," he thought, "mother could not forego it." In his room there was all the necessary paraphernalia for painting, easel, palette and everything in luxurious, tasteful perfection. On the grand piano of the salon lay a pile of new music and so on step for step a surprise awaited Bruno.

"And now see my christmas present," said the mothet, at last waving with a radiant smile and triumphant flourishing a bit of paper. A caplegram from America. And Bruno read: Born, a son yesterday. Now I am completely happy. Amalie.

"Hurrah—mother!"

"But seek father Bruno," urged his mother.

"Still more?. But mother what else can there be that you can give me?"

"Oh there may be something

else. Just look for it, 'Seek ye and ye shall find,' says the gospel."

"Really another present? I have so much already, where shall I put it all?"

"Oh, you will find some corner for this present. The last one and that you know, is always the best," replied his mother with a roguish twinkle and yet a trembling voice. She pointed to the dividing curtains between the parlor and her boudoir.

"That's so," said Bruno, "that always was the holy of holies."

Smiling but almost wearied he approached the door and drew the curtain—"Oh God!" he exclaimed. There stood Regina in her plain, woolen gown, her rich hair werathed in myrtle, at her corsage were fastened myrtle and orange blossoms. With beaming eyes she looked at her lover, then slowly raised her arms toward him.

And now all was forgotten! The father's hardness, Regina's sad youth, the mother's years of suffering—all—everything. The whole house was full of kindness and joy. Even Herr Kaunitz had a joyful smile on his lips. He, too had received a novel christmas joy; he felt for the first time in his life, what he had never known before, the consciousness of having made somebody happy.

"And that is not such a bad feeling after all," he thought.

"I am the happiest here anyway," thought little Frau Kaunitz, for only a mother can be so happy. Regina's mother knows it and now, even Amalie knows it and I hope, Regina will learn it also."

Bruno led his beloved to the instrument and put his hands on the keys and like a happy sob the old christmas carol broke forth. "Oh thou happy, oh thou merry, grace-inviting christmas tide."

The stately Herr Kaunitz even could not restrain his lips from forming a sort of a pout and softly humming the air, while he walked slowly up and down the room, his hands on his back. Frau Kaunitz looked at him in amazement and for the first time in her life she had to laugh at her husband.

NEXT STAGES OF MAN'S DEVELOPMENT.

By Ernest Maeckel.

The first stages of the development of mankind will be mostly mental, the evolution of a better and finer brain. When man's brain begins to develop rapidly there is no further need for great changes in his body. And yet some physical changes are still going on. Man will probably lose some of his teeth, there being not the use for them that there was, and there are signs that the little toes will also disappear, leaving man a four toed animal.

But these changes are of small significance compared with our mental development. There are, however, tremendous influence at work in developing mankind—a vast and fasinating field of study. Man being a product of natural evolution and development, his institutions must necessarily be a like product, and the application of the theory to political and social economy, statecraft, and education offers the most hopeful fields of work for future thinkers.

Life was never more complex than it is today, and there is no prophesying the exact lines of future development. Man at present seems to be developing or retro-

grading in masses–by nations, and yet under different influence. In Germany the tendency is all toward the centralizal tion of power in government, the removaof individual responsibility, and the workiug together of large masses of men as one man. In America the tendency has been different; there the individual is developed; he has great powers and responsibilities–the man is the unit. Who shall say how these great influences will work out?

The beautiful and accurate pictures of animals and plants now obtainable, where thirty years ago there were almost none, is an instance of one of the smaller. and yet important influences of modern life. Pictures convey ideas swiftly and accurately therefore they serve as a new and powerful factor in education, scientific education, in paticular. A man may become comparatively familiar with the animal forms of the world in a short time through the perfect pietures now obtainable, whereas a few years ago it would have taken a lifetime.

Then there are other influences. In Europe there is the influenc of what is military selection, all the younger men being taken at a certain age, removed from productive labor or study, and put through exactly similar traingng for one or two years, In Americr there is no such inffuence. How such training or lack of it will develop the race is a question to which the future must furnish the solution.

Medical selection is one of the most powerfuf modern influences. Medical science has made great srtides in the last few years; it saves many lives that otherwise would have been lost and frequently it keeps people with dangerous diseases alive for years. This must not only tend to breed a sickly race, but it necessarily swells the population largely, the crowding bringing with it new and difficult problems.

The earth is now almost wholly inha. bited; there are no longer any new places for immigration and the development of virgin land- This means the elimination of that potent influence which has had so great a share in the progress of the world during the last few hundred years. The contest must now change. Instead of discovering and settling new continents and ffghting savages, civilized man must set himself to a terrible new struggle for existence, between the older nations; for instance, in commerce and trade, tariffs, spheres of influence, and so on; and the strongest, most easily adaptable, most resourceful, most favored nations will win.

The remarkable, retrogression of the Latin races during the last few decades is a striking instance of this new struggle–especially the retrogression of the once powerful Spain.

The nineteenth century has been the golden era of science—there will never again be so many discoveries of profound importance. There are no more great universal generalizations to be made, like the law of conservation of energy, the attraction of gravitation, and the theoary of natural evolution. The work of future scientists will deal largely with the application of the great principles and generalizations already well known. This does not mean that wonderful new scientific discoveries will not be made, but that they will not have the profound importance of these laws.

I look for the greateat future development in the science of chemistry. Some day by its aid man will be able to produce a living substance by artificial processes; in other words, to make life is not at all beyond the range of science, strange and improbable as it may seem. It is only what plants are doing all the time, taking so many parts of carbon, hybrogen, nitrogen and so on, and combining them into the albuminous substance which we call protoplasm, the living substance. Science can combine these elements just as nature does, the proportion being exactly known, but

not yet to produce life. The album molecule is complicated. Science does not know yet how the various atoms of carbon-oxygen, and so on, which compose it, are united, and all attempts to solve the problem of the albumen molecule, what it really is, and how the elemenns are joined with it, have been so far without avail. But I belleve firmly that this great question will some day pe solved. If it is, then the artificial production of life will be a possibility.

"I PRAISE THE LOARD, AND ASK FORGIVENESS."

The United States Treasurer has received the following letter, inclosing a contribution to the Conscience fund:

"GRAND ISLANDS, NEB., Aug. 29, 1899. Auditor Treasurer, Post Office Department, Washington, D. C.

Dear Sir and Brother:—Since I became a Christian the loard has shown me that many years ago, when I was postmaster at Lodge, Platt County, Ill., that I fell into a snare of the devil and yielded to temptation by raising my cancellation, and wronged the Department out of 65 cents. He has also led me to make this statement and ask forgiveness. Inclosed 65 cents in coin, which I send you as restitution money. I praise the loard for salvation, and I leave the results with Him who doeth all things well.

I am now engaged on mission work. My wife and I travel together. We visit jails and preach to the prisoners, also we visit county poor farms, and carry the gospel to the poor as taught in the Word. I will say to you, if you are an unsaved man, let me exhort you to give your heart to Jesus. May God bless you, is my prayer. Inclosed find one of my tracts and some others. Please read all of them with a prayerful heart. Will praise the loard your salvation full and free. Your brother in the work for the Master blessedly sacred and sanctified."

MCCLURE'S.

McClure's Magazine for January. The first in a series of memoirs by Miss Clara Morris.

There is a careful and vivid pen-picture of the Emporer William, that most interesting figure of contemporary royalty. A third article of merit is entitled "Great Achievements of Modern Bridge Building."

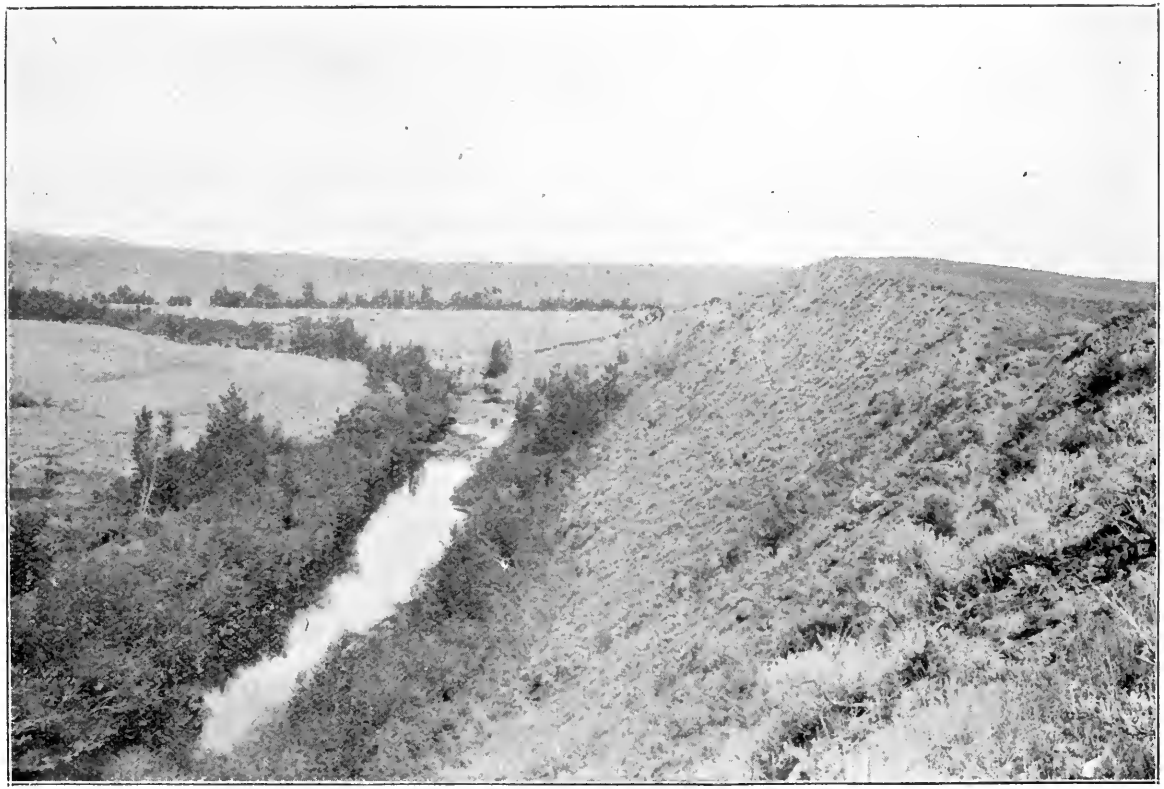
A second installment of Mr. Rudyard Kipling's new novel "Kim," appears with illustrations by Mr. Edwin Lord Weeks and Er. J. Lockwood Kipling. The short stories cover a wide range, and they are splendidly illustrated.

LADIES' HOME JOURNAL.

"The Baltimore Belle Who Made the Most Brilliant Match of any Girl in America" is the title of an article in the *Ladies' Home Journal* for January. "Housekeeping in a Millionaire's Family" "The Little Woman's Play," adapted for Miss Alcott's charming story, for stage presentation, and illustrated by Reginald B. Birch, and two pictorial pages, "A Winter Service at Church," by W. L. Taylor, and "The Town Meeting," by A. B. Frost, are some others of the leading literary and artistic features with which the journal begins the twentieth century. "The Forehandedness of Lucinda Smith," by "Josiah Allen's Wife," Elizabeth Stuart Phelp's "The Successors of Mary the First," "The Story of a Young Man," by Clifford Howard, and another "Blue River Bear Story," by Charles Major, are also among the many excellent things presented in the January journal.

SCRIBNER'S.

Scribner's for January contains "The Sinecure," by E. W. Horning, "Russia of Today," by Henry Norman, "A Comparison of the Armies in China," by Thomas F. Millard. "The Plague Ships," by Stephen Bonsal, and plenty of other interesting reading.



THE IRRIGATION AGE.

VOL. XV. CHICAGO, FEBRUARY, 1901. NO. 5

THE PROGRESS OF WESTERN AMERICA.

Victoria the Great.

When the great bell of St. Pauls proclaimed to London the passing of Queen Victoria, and later when the sad news was transmitted over continents and under seas to all quarters of the globe, there was only one feeling in all hearts—that of love and admiration and tenderest regret and sorrow for one whose life and name stood not alone for the sceptered majesty of a great kingdom and empire, but also for one of the noblest and purest ideals of womanhood.

Kindred in race and blood, speaking the same tongue and claiming part of the same glorious heritage of ancient renown, America today stands side by side with Britania at Victoria's bier.

Americans have warm hearts and recognize their friends whoever they may be. And in Queen Victoria, throughout her long life, this country always had a firm friend. In the dark days of civil strife and war, when some of her statesmen faltered and declared the union was about to be dissolved, Queen Victoria was steadfast and never ceased to uphold the side and cause she believed to be for the right and whose triumph would mean most for advancing humanity. It is matter of history that but for her influence England probably would have gone to war with the United States over the Slidell and Mason affair, and in the early days of the Spanish American trouble it is now known that Queen Victoria also expressed to the president of the United States her belief in the righteousness of America's cause, and assured him of England's friendship and sympathy.

In Europe, also, her name was a bulwark of peace. Connected by ties of relationship with most of the crowned heads of Europe, all European rulers were ready to strain a point, if need be, to keep on terms of peace with the empire over which Victoria ruled. Like Alexander III. of Russia, "the peacemaker of Europe." Queen Victoria's counsel and influence always were cast on the side of peace. That events which were too strong for her to overrule led to the South African war and its many disasters was the greatest sorrow of the closing days of her life. This tragic finale to her reign adds a pathos to her death, which was probably hastened by worry and sorrow over the South African tragedy and events she felt herself powerless to control. And it is significant of the place Victoria held in the world's heart that not one, not even the embattled Boers of South Africa, held her responsible for the mistakes which precipitated England's most disastrous war of the century or for the cruelties with which, in part at least, it has been conducted.

As to her epitaph, that is characteristic and was written by herself against the time, now at hand, when she should be

laid in the marble sarcophagus at Frogmore beside that of Prince Albert:

"Victoria-Albert,
Here at last I shall
Rest with thee;
With thee in Christ
Shall rise again."

The San Carlos Dam. The committee on Indian affairs of the senate considered and favorably reported an amendment providing $100,000 for the beginning of work on the San Carlos reservoir in Arizona. If this amendment is made part of the Indian appropriation bill, it will afford work for the starving Pima Indians, and will be the commencement of one of the best reservoir propositions in the arid regions, one, too, which will perhaps best demonstrate the practicability and excellence of the national irrigation policy.

Irrigation Debate. The irrigation debate in the house of representatives, in connection with the river and harbor bill, brought forth the best showing which has yet been made in that branch of congress on this subject.

The managers of the river and harbor measure claimed that irrigation and the reclamation of the arid West were not subjects properly under the jurisdiction of the River aud Harbor Committee, and that appropriations for reservoir construction should not be inserted in the River and Harbor bill. The Western members however took the ground that the contrl of the floods and regulation of the flow of the streams by reservoir construction were properly within the scope of the River and Harbor bill, and the ruling of the Speaker that the amendment offered was germane to the bill is significant.

The reclamation of the arid region is a question which is strong enough to stand entirely upon its own foundation and be treated as a separate proposition. At the same time the problem of river control and of the utilization of the flood waters for irrigation are so inter-related that it is inevitable that appropriations will ultimately be made along the same lines as they are for river and harbor improvement.

The sentiment in the House in favor of irrigation recognition of some sort is becoming stronger and stronger and cannot much longer be successfully overcome. In the Senate the sentiment favorable to arid land reclamation is yet stronger. Meantime the feeling throughout the country generally is growing, growing East as well as West, into a great national movement which will sooner or later have its way. The time is approaching. It cannot be far distant.

Cause for Encouragement. The friends of Irrigation need not fear that because of the adverse treatment received by the great number of irrigation bills and amendments introduced in congress, especially in the house of representatives, the national irrigation cause has suffered. It must be remembered that the irrigation movement is a new thing in the East. Prior to the present session of congress it has hardly been considered seriously by ten per cent. of the Eastern congressmen. And it must be remembered that in what may be considered the early stages of a new movement, a great mass of literature and discussion and effort must be put forth which will serve simply as a means of directing attention to the subject and indicating the variety of interests and purposes favoring and behind it. When individual efforts and attempts at legislation in the shape of bills introduced and amendments offered in congress become so numerous and insistent as to assume the nature of a public clamor, then the proper committee, whether hostile or favorably disposed to the project, must give the matter consideration; must gather all the kindred bills together and formulate from them a comprehensive measure, and make a report upon it. This is the situation in the present short session of congress. Old and expected legislation is pressing in great volume for enactment, and congressmen are not willing, in the limited time at their disposal this winter, to take up exhaustively a new question, nor is it the purpose of the friends of irrigation to attempt to force the subject. Nevertheless every congressman now knows that the

question is a coming one and a question considered to be of great and pressing interest to a large number of people, including the commercial sections of the East with their vast manufactories looking for a market for their products.

The desultory agitation of this session on the irrigation subject is serving its purpose well.

New Markets. What would be the result of opening any one of the thousand valleys of the West which only await the building of great storage reservoirs and the utilization of the water saved to convert them into thriving communities of small rural homes? A thousand farms would be quickly created. A thousand houses would go up, a thousand families would move into them, and a thousand farms would want plows and wagons and machines and harnesses, while a thousand housewives would want kitchen and household utensils, and several thousand people would want clothes and boots and shoes and hats and books and papers and fifty other articles. This demand instead of being supplied once only, would increase and go on perpetually. And the demand for these things would go to the producing East. This is why the reclamation of the West would help Massachusetts.

CONDITIONS FAVORABLE AND UNFAVORABLE TO IRRIGATION.

By J. Ulrich.

(Continued from last month.)

With the corporation, however, it is different. The opportunity thus presented for investment was with it the prime consideration. It was no part of its program to actually improve and farm these lands; none of the individuals composing its personnel ever expected to make a home thereon. In most cases they were all non-residents, whose homes were not even within the limits of the arid region. The object of their operations was the acquisition of large bodies of lands and valuable water franchises, which were to be sold at a profit, after the development of their proposed irrigation plant, to people who might desire to improve and actually farm the lands. The actual relation of the real owners of these enterprises to the properties themselves is usually even more remote than this. The financial interests are generally represented by the bondholders, who through the purchase of bonds have advanced the money for the building of works.

The stock of the corporation irrigation systems is not, as in the case of the community stock organization, in the hands of the farmers and actual water consumers under the system; it is held and controlled by the promoters and organizers of the enterprise. Its affairs are also controlled by a board of directors, who are elected by a vote of the stockholders. The executive officers are the president, secretary, and treasurer, but the details of the executive management usually devolve upon an officer appointed by the board, who is called the manager (sometimes the general manager), who lives, or should live, within easy access to the works. The manager has the appointing of and directs the operations of all the employees beneath him in rank, and is in fact the local dictator of the policy and management of the concern.

In most cases these corporations own and handle lands as well as water, the land feature being frequently the most important of the two. Where they own lands the latter are generally sold in connection with water, at a price which includes both. The land is rarely sold alone, since it has no value except in connection with the water, which usually can not be secured except from the irrigation company.

Under this corporation régime water is not represented by shares of stock, as it is in the community organizations, but by a " water

right," which is a right to a certain specified quantity of water, or to the amount necessary to irrigate a certain tract of land, the amount given for this purpose varying with different companies. The quantity of water really necessary to irrigate an acre varies widely in different localities, and again materially with the crop under consideration. While in Colorado and Idaho a flow of 1 cubic foot per second is usually furnished and applied to 50 acres of alfalfa, the same volume will supply the necessities of 500 acres of citrus fruits in southern California.

The irrigation corporation constructs, operates, and maintains the main line of canal or other conduit by which the water is diverted from the river and conveyed to or within easy access to the land to be reclaimed; and in addition thereto, and particularly where these lands belong to the corporation, it usually constructs a number of large lateral branches, which are diverted from the main line at convenient points and traverse the principal bodies of lands. These are designed for the purpose of bringing the water within reasonable proximity to such lands as are located at considerable distances from the main works. The main canal or conduit necessarily occupies a position outside and above all the area to be reclaimed. Without these branches a decided hardship upon some of the water consumers would be involved in the necessary construction of private ditches of great length for conveying their water from the main works, a condition which would tend to place an embargo upon the sale of water. By means of this arrangement is also avoided the necessity, which would otherwise exist, for tapping the main line at a great number of points for the diversion of water for individual consumers, as well as the objectional feature involved in the great multiplicity of private lateral ditches across the entire body of lands.

The main canal and these principal branches are operated, maintained, and controlled by the corporation, and are patrolled and regulated by ditch riders in its employ.

The settler or farmer who has purchased water rights from the corporation is generally permitted to divert the water from any point on the main canal or any of the laterals found to be most convenient, subject, however, to the approval of the general manager or local superintendent. In either case, a head gate or regulating structure is placed at the point selected, for the purpose of regulating the amount diverted. This structnre is the private property of the individual for whose use it is erected, though it is designed and placed in position by the company, and is controlled and regulated by the ditch rider, who keeps it locked at the required degree of opening and himself carries the key. The ditch conveying the water from this structure to the land to be irrigated is most frequently constructed, main-

tained, and operated by the owner of the land at his own expense. It is, however, not usually of very great length, and is comparatively simple and inexpensive. In some cases the company contracts to deliver the water at some convenient point on the tract of land to be irrigated by it, in which cases all the lateral ditches are constructed and controlled by the company. This method involves a great additional expense of management and operation, and is not usually followed.

The practical results from operations conducted under the corporation régime do not materially differ, so far as the actual user of water is concerned, from those realized under the auspices of the community organization. The farmer's success is measured and determined almost entirely by the certainty and permanence of a satisfactory supply of water at a reasonably price. When these conditions are fulfilled it makes little difference under what character of organization he operates, the advantage of one system over the other being measured by the relative certainty of supply and the expense of getting it.

That the annual cost of water from a large corporation system is in most cases greater than from the smaller partnership or community canals is inevitable for several reasons. The latter are nearly always constructed first and occupy the best locations for cheap diversion and economical construction and do not usually require such extensive and costly headworks nor such a long line of expensive canal to be constructed and maintained before the irrigable area can be reached. These are advantages which the earlier enterprises have secured. In addition to more expensive construction and maintenance in the case of the larger canals, the salaries of general officers often materially increase the fixed charges, while the interest on the investment during the period between the construction of the canal and the settlement of lands and consequent sale of water rights and the expense incident to securing such settlements are always very large items of expense which do not figure in the community systems. More individual and community canals involve scarcely greater expense in construction and maintenance than do some of the individual and community lateral ditches which have to be constructed by the irrigators to convey their water from the company's main canal to their lands. So if the completed main canal systems should be turned over free to the land owners under them, they would have but similar advantages for irrigating their lands to those which many of the earlier settlers secured from the natural streams. To offset this added cost of irrigation which often prevails under these extensive corporate canals, the quality of the land covered by them is often superior to that of the lands along the river bottom and adjacent which were settled upon

and irrigated by the cheaper and more easily constructed ditches of the earlier settlers.

This plan of conducting the business of irrigation development has its good and its bad features. Through its agency great volumes of capital have been invested in the development of the agricultural possibilities of the arid region, much of which if dependent upon individual or community resources would have remained unproductive for many years. It is the corporation enterprises which enlist the interest of a majority of intending immigrants. It is usually a part of their business to effect the sale and settlement of the lands under them, and their magnitude usually warrants the expenditure of large sums in advertising for this purpose. In some cases the results achieved under these systems not only prove satisfactory to the farmers, but prove them to be safe and profitable investments for capital. In many respects these large canals are the best and most economical systems for the distribution of water to the lands covered by them. These lands are usually in a large and compact body, which gives many social and industrial advantages to the settlers upon them. A greater area can be irrigated with a given volume of water than by means of a multiplicity of scattered individual and community ditches. Taken altogether, these large systems have many things to recommend them and have materially advanced irrigation development and benefited the land owners under them.

In most instances, however, the investors in these enterprises have not met with the success they deserve. Many causes have contributed to this result, some of which have already been indicated. The systems have almost uniformly cost much more than the first estimates, while the area of irrigable land under them, the irrigating capacity of the canals, and the rapidity with which their settlement and the consequent use of the water could be accomplished have all been almost as uniformly estimated. Many years often elapse before the total discharge of the canal is utilized and before the income from water sold even meets the fixed charges for management and operation. Their location is sometimes distant from railway lines, cities, and local markets, which increases the expense and difficulties of securing settlers. If they follow individual and community ditches near settlements and markets already established they have later water rights than the earlier and smaller ditches. This inferiority of priority lessens the value of the property and is often a source of annoyance and expensive litigation with the earlier ditch owners and with their own consumers, who may have their water supply reduced or cut off in time of scarcity. Unless those charged with the design and construction of the works have made a special and very careful study of the lands, water supply, and prior rights thereto before be-

ginning work, they have little positive information as to the real elements of value in their investment, and they have not always done this. The capitalists whose millions have been thus invested have naturally been more ignorant of the principles involved than the promoters and have often been deluded into believing that fabulous profits were to be realized through such investments.

In this manner a few irrigation works have been created throughout the arid region for whose existence there was no warrant whatever, whose priority rights to the use of water are practically worthless, either for the reason that the supply never existed, or because the available water had been appropriated long before the propositions under consideration had been conceived and executed. These schemes not only work a permanent injury to the interests of legitimate enterprises in this field and to irrigation development in general, but are a menace to the future prosperity of the immigrant to the arid region, who, being unacquainted with irrigation practice and unfamiliar with the principles involved, can not intelligently determine the relative merits of the different propositions presented for his consideration, and thus frequently falls a victim to the misrepresentations of colonization agents, who, through the agency of elaborate and beautifully executed prospectuses, present the most alluring descriptions of the wonderful opportunities which await the settler who will purchase a quarter section of land and a water right from their companies—whose canals may, in fact, be perfectly dry for ten months in the year. Those who have been thus induced to invest their savings in these arid lands and worthless water rights may lose not only their money, but frequently many years of time wrestling with the adverse conditions growing out of their efforts to farm arid lands without a sufficient supply of water. They may succeed in eking out a precarious existence for several years, but are likely to find themselves becoming poorer with the advance of time, until at last, convinced of the futility of their efforts and the hopelessness of the prospect before them, they give up in despair, and, moving to some other locality, begin anew under more favorable conditions, with less money but with a vastly increased fund of information concerning the importance and necessity of a safe and certain water right in order to profitably conduct agricultural operations in the arid region.

THE DISTRICT SYSTEM.

Another method of constructing or otherwise obtaining a system of works for the irrigation of a given area of land is what is known as the "district irrigation system." The law under which this system is carried out originated in California, and although its general features have been copied, with greater or less modification of details, into the statutes of some other states, notably Idaho and Nebraska, the opera-

tions under the system have been almost wholly confined to the first-mentioned state. This district law is designed to secure the ownership and control of the water rights and canal systems by the people of the districts organized under its provisions. A district may be organized by a vote of two-thirds of its residents, upon an order of the board of county commissioners, which acts upon petition of a certain number or a certain proportion of the residents of the territory proposed thus to be organized as a district. After the organization, bonds for the construction or purchase of the works or property necessary to the object in view may be voted, which bonds become a lien upon the real property within the district. The interest is paid by assessments, similar to other public taxes, and the operating expenses are raised either by assessments, by valuation or acreage, or by tolls for the use of the water. This system has many theoretical advantages, but its operation in California has not justified the prophecies of its advocates, and new districts are not being formed under it. The powers granted the districts seem to have been exercised in many cases with poor judgment. and heavy bonded indebtedness was incurred without corresponding advantages to the land owner in the form of water for his needs. In some instances the provisions of the law seem to have been taken advantage of for the purpose of turning unremunerative existing property and water rights into interest-bearing district bonds. Like other business enterprises, it depends for its success upon the judgment and honesty of those intrusted with the management of the business of the districts thus organized.

Each system and locality has its own peculiar features, and the best location and system is therefore a matter for careful investigation as to relative advantages, always having in mind, however, the certainty of the water supply, which is often the most difficult matter for the newcomer to get reliable information about. As this condition is the principal factor in successful farming operations, when it is satisfied such operations intelligently conducted will generally prove certain and remunerative under any of the plans herein described.

OPERATION OF CANALS.

The owner of an individual ditch operates it as he pleases, subject only to the state laws governing the diversion and use of water. But when several persons are interested in the same ditch, the necessity for some system of control arises. In the case of unincorporated community canals this control is secured by the selection of a water master, who is usually one of the owners, to have charge of the operation and maintenance of the system and the distribution of its water to those entitled to its use. It is on the large corporation canals, however, that the necessity for a careful system of operation and management is most apparent. Many of these canals are more than

50 miles long, and number their water users by hundreds. The Ridenbaugh Canal in the Boise Valley, Idaho, furnishes water to more than 500 farmers. The High Line Canal, in Colorado, has 433 consumers under it; the Loveland and Greeley has 257, and many other systems are as large or larger. It can thus be readily seen that the proper operation of such canals involves a very thorough business organization and careful attention to many important details.

The practical operation of corporation canal systems is, like their construction, under the control of the executive officer or officers of the company, but the representative with whom the farmer and irrigator comes into most frequent and intimate contact is the ditch rider, who is generally appointed by the manager or president. His duties consist in patrolling the ditch throughout the season of actual operation, for the purpose of seeing that the works are in good repair, and to superintend the proper distribution of water to the various stockholders or irrigators from the system, and are somewhat similar to those of the water commissioner hereafter described, the main canal in this case taking the place of the stream, and the contracts or stock the place of the pricrity decree. In order to properly distribute the water the ditch rider is provided with a list of the persons having water rights from the canal, showing the amount to which each is entitled under his contract; or in case of community stock companies, with a list of the stockholders and the amount of stock owned by each. Such a list furnishes the necessary data to enable him to distribute the water according to the quantity or proportion called for by these respective interests.

The larger irrigation systems generally have several distributary canals leading from the main one and following as nearly as possible the ridges or highest ground of the areas designed to be watered from them. Such distributaries obviate the necessity for such long and expensive individual lateral ditches as would be necessary if all such laterals diverted directly from the main canal. The expense of individual diverting works, as well as the danger attendant upon a multitude of diversions from the main canal, is also much reduced. The distributaries also generally follow the slopes of the ridges, and do not have a uniform light grade, as is the case with the main canals. Sometimes, also, natural drainage channels are followed, thus materially reducing their cost of construction.

At various points along the main canal or distributary lateral branches are diverted for conveying the water to the land of the individual consumers. As the amount to which each user is entitled is limited, it becomes necessary to place regulating structures at the points of diversion for the purpose of regulating the flow into these laterals. These consist of wooden, box-like structures in which slid-

ing gates are placed, by which the size of aperture from the main canal is regulated and the flow of water therefrom controlled. Where considerable accuracy of results is attempted, there is also placed in the lateral ditch below the regulating gates a weir whose flow for all depths is computed and tabulated, and for the purpose of determining the depth at any time a graduation scale is so placed with reference to the weir that the depth can be conveniently and accurately read off. When it is desired to deliver into a lateral, so arranged, a given volume of water, it is merely necessary for the ditch rider to consult his weir tables and find the depth over this weir necessary to discharge the required amount. He then increases or lessens the opening from the main canal by moving the sliding gate in the regulating structure until the required depth over the weir is realized. This is the most important duty of the ditch rider, and for its proper execution he is expected to make a trip daily over the entire canal, or his division of it, and to examine and regulate the gate of every consumer. He usually travels on horseback or in a two-wheeled cart, and carries a shovel, a hatchet, a small sharp-pointed bar, and frequently a number of empty sacks. The hatchet is used to repair structures and nail on boards which may have become loosened; the bar is for raising gates which may be difficult to move by hand; and the shovel and sacks are frequently required for the repair of banks and the stoppage of holes caused by the work of gophers, muskrats, and other burrowing animals, whose depredations frequently result in serious and expensive breaks in the embankments. The holes thus made are usually small and insignificant at first, but become rapidly enlarged through the erosion of the escaping waters, and if not stopped eventually result in a breach carrying away a portion of the embankment. The ditch rider, however, is expected to inspect the whole works under his charge daily, and usually detects the leaks by means of the escaping waters before serious results ensue. Upon the discovery of a leak thus caused, his first efforts are directed to the location of the point on the inside of the bank at which the water enters the hole. This is frequently detected through the eddy or vortex appearing at or near the opening. Having located this point, the orifice, if small, can be closed by pushing into the hole one or two empty sacks; if already too large to be closed in this manner, it can usually be accomplished by first filling a few sacks a half or a third full of loose earth and ramming them into the mouth of the opening into which the water from the ditch is passing. In this manner holes of considerable size can usually be effectually stopped in a few minutes.

The regulating gates before mentioned are frequently kept locked, as already stated, and the key thereto carried by the ditch rider. When, as frequently occurs, a water consumer has completed his irri-

gation and has for the time being no use for water, he may desire that it be shut out from his lateral. In such cases he leaves a note tacked on his head gate, requesting the ditch rider to shut it off at a specified time, and in the same manner notifies him to turn it on when he again needs it. The ditch rider gets these messages when he makes his daily round over the ditch.

Where a ditch does not exceed 12 or 15 miles in length one ditch rider is expected to patrol its entire length, but upon more extensive systems several may be required to perform these duties. Where there are several required the canal is divided into divisions, each of which is patrolled by a separate rider. In such cases the length of a division ridden by one man depends upon the character of the duties, varying materially with the amount of repairs, the danger of breaks and leaks, and the number of regulating gates to look after. The average length of a division is, however, from 12 to 15 miles, and the average compensation for the work ranges from $50 to $75 per month, out of which he must pay his own board and furnish and maintain his own horse and cart.

AN UNWATERED EMPIRE.

By Gen. Nelson A. Miles.

My interest in the subject of irrigation began some three decades ago when, in the performance of official duty, I had occasion to explore more or less thoroughly that vast extent of sparsely settled or unoccupied land bounded on the east by the one-hundredth meridian, on the north by the 49th parallel, on the south by the Rio Grande, and extending to the Sierra Nevada and Cascade ranges on the west. The thought often occurred to me then—and the thought has grown into a conviction as the years have gone by—that it was not the part of economy of nature to have this enormous expanse of land lie inert and waste. Millions of acres were apparently desert, where the coyote starved and only the cactus and sage bush could live; yet the soil held within itself the elements of productiveness, the air was as pure as heaven, the scenery inspiring as a beautiful picture, the application of the vivifying water the only thing lacking to arouse its rich potential energies.

Since those early days I have, from time to time, with voice and pen, done what I could to advocate the conservation of the water supply of our arid lands and the preservation of the trees, which are the guardians of the fountains at the waters' source.

Since the foundation of our Government center of population has been steadily moving westward, the pioneer spirit of the East seeking homes and independence far away from the stifling atmosphere of the large overcrowded cities. This united desire of our people to own a home rather than to rent one—to be their own landlords rather than some landlord's tenants—assures the vitality of the great American Republic. The American farmer is soverign to-day, and the dignity and independence engendered by his free environment, the healthfulness of mind and body resulting from the pure air he breathes, the love of country which home-owning stimulates, make him the preserver of those beneficial institutions under which we live

It would be a sad day, full of evil portent to the Republic, if home-building should become unpopular, if gravitation towards the cities should overcome the outward march into the expansive country, if tenantry in an over-crowded alley should be chosen in preference to a free quarter section in valley or upland. Therefore I say the devising of means whereby the public domain is available for home-seekers, and the arid lands are made habitable and productive, is now one of the most important lines of American endeavor. I reiterate

the saying of the keen satirist and wise philosopher: That whoever could make two ears of corn or two blades of grass to grow upon a spot of ground where only one grew before, would deserve better of mankind and do more essential service to his country than the whole race of politicians put together.

The utility of irrigation ceased to be questioned thousands of years ago, and we have the records of successful methods which are as old as the first pages of written history itself. We have evidence that the aborigines of the southwest had perfected a system of irrigation, and the natives of New Mexico and Arizona, who brought their methods from Mexico and Spain, handed down their skill to posterity.

I am not optimistic enough to believe the ingenuity of men can encompass the redemption of the six hundred millions of acres which comprise the nation's vacant public lands, but if, as had been claimed there is water enough for the irrigation of one hundred millions of acres (providing the supply is economically used), I can easily imagine ten millions of good citizens finding homes on farms which are self-supporting. In the state of Texas there are still many millions of acres of unclaimed acres which would lend themselves readily to irrigation methods and become valuable to settlers. The area of this great state may be appreciated by remembering the fact that if it were populated as densely as the state of Massachusetts there would be over ninety millions of souls within its borders. But it is the immense tracts that embrace a large part of Arizona, New Mexico, Utah and Nevada, much of Wyoming, Colorado, California and Oregon, and the basin of the Columbia in interior Washington, which comprise mainly the public domain.

It appears that private or corporate enterprise cannot be trusted to control the improvement and reclamation with justice and equality for all concerned. The states themselves are as yet not financially strong enough to undertake the task. It seems to me, therefore, that the plan proposed is the most feasable and just. It is: Let the Government build the storage reservoirs and the main line canals, and the settlers provide the smaller distributing system by banding themselves together in co-operative organizations.

I believe that Congress is awakening to a sense of the importance and propriety of lending national aid to the movement. Already considerable sums have been appropriated for the purpose of investigating hydrographic conditions, measuring streams, making reservoir surveys, etc., and I believe that before long the policy of national aid in the building of storage reservoirs will be established.

The Government has spent over eleven millions of dollars in improving the navigation of the Missouri river, as its middle course

is through an arid or semi-arid region, and as the necessity for water transportation increases in direct ratio to the productiveness of the land through which the river flows, it seems logical and right that the attention of the Federal authority should now be given to the conservation, for irrigation purposes, of its surplus flood, which does such great damage along its lower course when, swelled by melting snows, its mighty volume bursts through its expensive confines.

The National Government has appropriated, to June 30, 1900, for expenditure by the Mississippi River Commission, $37,647,780.17, of which $15,403,901.87 were expended for levees. There must be added to this latter item over fifteen millions of dollars contributed by the states, making thirty and one-half millions expended in efforts to confine the surplus wealth of vitalizing fluid contributed by mountains until it is lost in the great ocean. Think of the thousands of farms that could be made productive by the judicious expenditure of only a part of this great sum. There are able engineers who even question the wisdom of constructing artificial banks, claiming that sooner or later the restless flood will break through, and when it does the damage will be a thousand-fold greater than it would were the waters allowed to spread as nature permitted.

But there is no question as to the utility of storing up a portion of the flow of water that runs away in non-irrigation seasons that it may be available for use during the growing periods. As a distinguished United States engineer, referring to the arid region of the West, reports, "In no other part of the Uuited States, or anywhere else in the world, are there such potent and conclusive reasons, of a public as well as a private nature, for the construction of a comprehensive reservoir system."

A PLAN FOR RECLAIMING THE ARID LANDS OF OUR GREAT WEST.

By C. B. Parker.

After an experience of forty years west of the Missouri river, and several years of the time in the saddle from Omaha to Portland, Oregon, from North Dakota to Texas and from British Columbia on the coast to Mexico and after advocating for thirty years the political econony and practicability of irrigating by United States Government this vast enterprise of now worthless land equal in area to ten states the size of Ohio and thereby reclaiming it to the highest possible state of productiveness capable of providing homes for and sustaining a population of 100,000,000 of the over-crowded of our eastern cities and those coming to our shores from Europe.

The writer was highly gratified as a delegate to the late National Irrigation Congress that convened at Chicago, Nov. 21 to 24, participated in by such notables as Gen Nelson A. Miles, Gov. Roosevelt, Secretary of Agriculture, Wilson; Senator Foster, of Washington, Senator Carter, of Montana, Senator Perkins, of California, and Senator Beverige, of Indiana, as well as Hons. A. C. Bartlett, James Deering, Geo. F. Stone, John E. Springer, of Chicago, and Pres. James J. Hill, of the Great Northern R. R., and Gov. Pettis, of Arizona, all advocating irrigation by Government Aid.

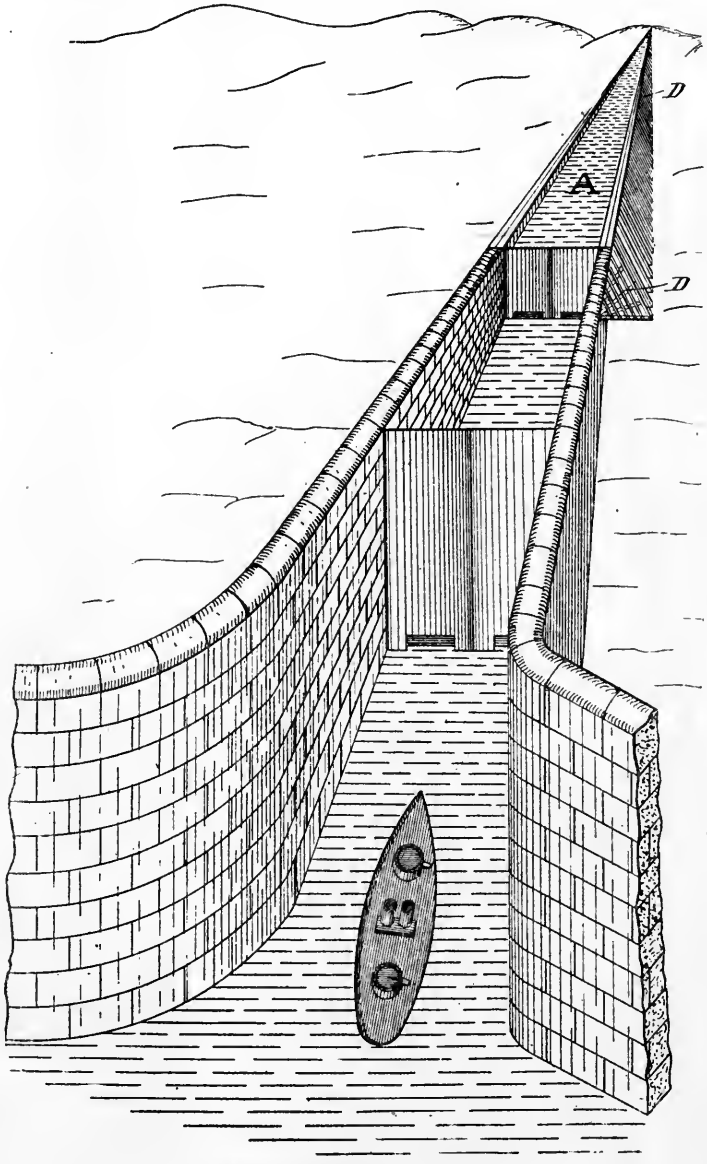
Congress was memorialized to construct reservoirs by a system of dams in the mountains and foot-hills for storing the early flood-waters of summer and President McKinley was telegraphed, asking his attention to the matter is his next message to congress. Much discussion was given to the complex question of the impracticability of elevating water onto much of this more elevated land and the loss of water by seepage in the ditches of the more sandy regions.

Now these objections, are as the writer believes, fully met and overcome by the patented invention of Col. Alexander Hoagland, of Louisville, Kentucky, in his steel channel or canal, concrete lined, that is thoroughly indorsed as practical from economic and sanitary standpoints.

Imagine a steel canal, concrete lined, from North Dakota to Galveston ,resting on a concrete foundation, constructed in one-half the time, at one-third less expense than a dry canal and supplied with water in the regions of greatest altitude by Col. Hoagland's pump or

elevator at the rate of 3,000 gallons per minute from artesian wells as may be necessary.

Some of the advantages of this reservoir retaining system of

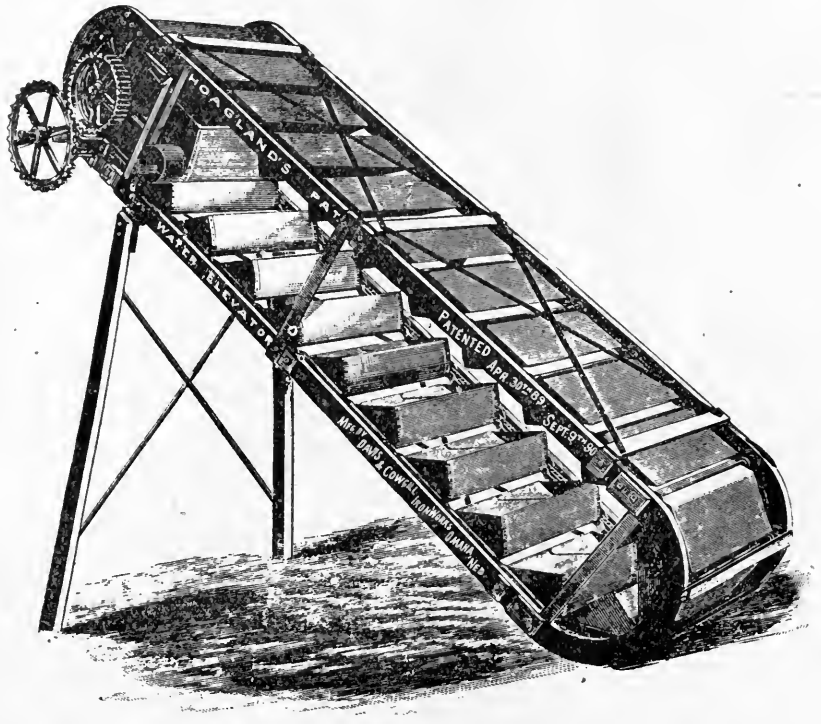


MARITINE SHIP CANAL.

storing the early flood-waters of the mountain streams are: 1st. To hold in store for use later in the season for irrigation purposes. 2nd. Preventing the annual damage by floods to crops, property and live

stock in the Mississippi Delta. 3d. As a sanitary measure avoiding or preventing the epidemics of malaria and fevers that prevail as a result of the annual overflow of the low lands of the Mississippi Valley from Omaha to New Orleans. Government has found this to be one of her perplexing as well as expensive wards to regulate at as great an expenditure yearly as the cost of hundreds of miles of this steel canal, and the loss of crops, live stock and property for a single year would complete our system from the Canada line to Galveston.

Some of the advantages of our enterprise are:



ELEVATOR.

1st. The rise in value of all this land.

2nd. Valuation of crops, fruits and dairy products not overlooking the poultry industry that now excells in all our great central western states the entire wheat crop.

3rd. Rents and revenue from water tax.

4th. Freight and traffic for the Railroads.

5th. Happy homes for the millions in our country with the best climate in the world.

6th. The building of villages, towns and cities.

7th. The opening and developing of the greatest iron and coal mines, furnaces and foundries in the world for the manufacturing of

the steel and iron for our canal on the ground and forever furnishing employment for thousands in the great Western industrial possibilities.

Was ever such a jigantic or colossal opportunity offered for a truly American system of "Home Expansion" and development of these arid lands and the sleeping billions of ore and coal in the mountains deposited there by our Beneficent Creator and surely this we have a right to without the humiliation of asking permission of Great Britain or any other country, as in our much wanted and surely needed Nicaragua canal.

Irrigating the West is no longer considered a sectional enterprise but one purely National and we believe this plan of the steel canal being properly shown to congress, they will see it as practical, feasable, logical and of sound political economy, promising greatest returns for the outlay than any plan or enterprise in the history of our grand country.

THE DIVERSIFIED FARM.

PROFITS IN CHICORY.

The growing of chicory has become a profitable industry in the past few years in the states of Michigan, Illinois, Wisconsin and Nebraska. The plant averages six to ten tons of roots per acre, many getting 15 to 20 tons from an acre, where the soil is properly prepared and cultivation perfect. From numerous reports made on the crop the general cost of growing an acre and preparing for the market ranges about $33, and the income at $6.00 to $8.00 per ton runs $50 to $80. The crop is practically the same as sugar beats in the yields, cost of growing and income from a given area. As the uses of chicory are established and increasing among Americans every year and factories are being erected in various places for handling the product the wide awake farmers have in this another valuable product that can be successfully handled in almost every section.

Chicory comes to us from Europe where it has been used for many centuries. It was regarded as a table delicacy in many forms among the ancient Romans, who used the tops as spinach and the roots for coffee. The use as coffee has become so general among the people of Europe, that the demand is greater than the supply. This accounts for the rapid increase in the planting of chicory in this country during the past three or four years. The plant is extensively used for pastures for sheep, and cut and cured the same as clovers for hay. Some reports are that an acre will yield the second year after planting fully 35 tons of forage and the next year will increase to 40 or more tons of good feed. This hay is valuable for feeding sheep and beef cattle. Hogs thrive on the roots and horses will eat both plant and roots and be benefitted by the toning effect on their system.

The soil best suited to chicory growing is the rich sandy loom, free of stones, containing little clay and well underdrained. Land that produces good carrots or parsnips will yield fine crops of chicory. The plant takes up much of the earth elements, especially potash. This plant needs a fertilizer something like the Irish potato; a complete mixture should contain about 8 per cent. each of phosphoric acid and potash and 3 per cent nitrogen and 500 to 700 pounds per acre is a fair application.

The chicory seed should be sown with a drill in rows 15 to 18 inches apart, and when the plants appear be thinned to stand about the same distance as parsnips. This is for the growth of roots. If only hay is wanted then the seed may be sown broadcast and left unthinned. For root growth about 2 pounds of seed will plant an acre, but for the hay crop 4 to 5 pounds may be drilled and even 20 pounds sown in the broadcast method. May is a good time for planting. Cultivation is practically the same as that given other root crop. Harvesting may be done with a plow, shovel or specially prepared machine. The tops should be cut off and used for forage and the roots stored in cellars or sent to the factory.

Many people desire to use chicory for home coffee and cannot purchase it on the market. Such persons can grow what they want and dry it as easily as they could

brown coffee and in much the same way. When mixed with good coffee at the rate of one part chicory to four parts coffee it makes a more pleasant and agreeable dinner beverage. Where a factory is approachable there is money in growing chicory and these are being established in different sections. If no factory is in reach then the plant may be successfully cultivated for the hay and the home value of the roots for feeding and as substitute for coffee. The farmer who has sheep or hogs or feed cattle for market will find in this plant a valuable addition to his crops. It may be used as a soiling crop on any worn farm to great advantage. It stands for years as a forage plant and assists in reclaiming worn-out land.

JOEL SHOMAKER.

HOW TO CONSTRUCT A SILO.

Mr. John Gould, of Ohio, who is in this respect well qualified, gives a detailed statement in the Michigan Farmer. We have rarely seen a more thorough presentation of the matter. By following closely these directions you cannot go far astray in building a silo. We quote from Mr. Gould as follows:

"To start with, a cow wants, in 175 days, about five tons of silage, or 50 pounds a day. This means (to cover all losses, waste on top, evaporation, etc), six tons as it falls on the hill in the field, and will, we think, make five tons of fed silage. Figure that an acre of good corn planted in 3½ feet rows, 10 to 11 quarts of seed to the acre, will make 15 tons of silage. Don't expect 30 to 75. Around silo 20x15 feet in diameter will hold 60 tons; 24x15 feet, 78 tons; 28x15 feet, 96 tons; 32x15 feet, 105 tons; 30x17 feet, 135 tons. In building, two smaller silos are preferable to one very large one, and for summer feeding, a small one—in comparison—is a necessity, on account of feeding off quite a thickness from the surface each day to prevent waste.

"At present the round stave silo seems to be the much-inquired-after sort. The experience with them has been quite as satisfactory as with the most costly framed ceiled silos. The discovery that freezing did not in any way injure the silage surface, and that silage was pretty difficult to freeze anyway, has made the tub silo all the more popular. As carriers have been so much improved, and 'man holes' so easily cut in a round silo, the disposition is now to make them deep, 30 feet if possible, so as to get great pressure from the weight of the silage itself. Staves can be made of any good timber feee from shakes —pine, hemlock, spruce, white wood and cucumber. The favorite width of staves 2x4, and 2x5 inch stuff. A wide stave is apt to 'buckle'. There is a wide difference of opinion about whether the staves should be matched or beveled, or both.

"In silo building long staves are avoided by splicing the ends of two staves of unequal length, so that when in the silo walls, the splice joint would not all come in the same circle. The ends of two staves are made square; both ends are sawed into one inch, and a tongue, made of a piece of galvanized iron 2x3¾ inches is put in and the stave hammered up to a close fit. In setting up the silo, before the hoops are tightened much, the staves should all be sprung back to a smooth surface. If staves are irregular widths, have the outside show it.

"Of hooping there is no end of a mixup between bands, rods and woven wire fence, the latter having points of much superiority over any other. The rods and band hoops need lugs and threads with double burrs so that the latter can not pull off, and when the silo either swells or shrinks, the burrs can be loosened or tightened as demanded. The coil wire fence with its torsion, makes a hoop that gives or takes up of its own accord, and the silo staves when dried out are up snug and can not 'fall together' on a hot day by looseness.

Four breadths of wire fence are ample. Fasten each end of a breadth of fence to two 54 inch long 4x4-inch hardwood scantlings, so that when wrapped about the silo the clamps will come within a foot of each other. Bolt these two clamps together with two 1-inch bolts, with secure heads and double burrs, using at least 3-inch washers. Put these breadths on 17-inches apart, so as to have 'man holes' between and cement. Round out the floor of the silo, so it will be the lowest in the center; pound down the clay hard, letting it come up against the staves over the cement. If rats bother, and are likely to come up from underneath, a cement floor would be well.

"Mark out squares for the 'manholes.' Nail on two cleats and clinch them and then saw out the 16x18 door. Rough and clinch strips on outside the hole for a close jointed 'jam.' Put the door in from the inside where it was sawed out from, and the silo is filled, make a little clay mortar, fill the inside of the jam with it, push in the door and tack it 'just to stay,' and one has a close-fitting, air-proof door. When feeding, dig down to it, kick it in from the outside, and do not bother with latches and hinges.

"Do not cover silage with an elaborate roof. It should not be shingle and pitch tight. A leaky roof is all the better for the silage. It would be better if all off when filling. Silos can go down into the ground if the fellow wants to throw silage up out of the silo. Make good, fair stonework for wall, and just before getting to the surface 'jog' the wall out from the inside enough to make a slight shoulder. Set the tub silo on this, then wall up outside, but cement to the silo. On the inside, plaster up to, and a little over the staves, and one has a close, air-proof 'union' of stone and stave. Silos of metal, combination, brick, etc., have not answered the expectations of their builders. The wooden silo of some sort has always proved best. It is not known whether paint has paid."

PRESERVED MILK.

The following bulletin was issued by the University of Arizona, and treats of the use of preservatives in milk, showing their harmfulness:

"Late in the month of September, while the weather was yet warm, one creamery patron was heard to say to another, 'What's that thing for?' indicating by a motion of his hand, a milk cooler standing near. Upon being told that it was a milk cooler, and that both morning and evening milk was cooled by its use every day before sending to the factory, the first speaker replied: 'What's the use of all that trouble? Get a little Preservaline, that will keep your milk all right and isn't half so much work,' and in his reply expressed, I am sorry to say, the sentiment of many creamery patrons.

"The use of preservatives in milk is the lazy man's substitute for cleanliness. The fact that it is deemed necessary to add something to the milk to keep it sweet until it reaches the factory is evidence of unclean or careless handling, while the fact that preservatives are added is evidence of criminal ignorance on the part of the persons using them.

"It is possible to make good butter or cheese only when the souring of the cream or milk is under control of the manufacturers. If, then, milk comes to the factory so adulterated by the use of chemicals that it will not sour, it is impossible to make good butter or cheese from it. In butter making large losses of fat in the butter have been traced to this cause, and we have known the entire make of a cheese factory for several days to be an absolute loss because a single patron used Preservaline in his milk.

But more important than these financial losses is the fact that the use of the preservatives renders the milk unwhole-

some and deleterious to health. The liquid preservatives most commonly used depend for their preserving power upon the presence of formic aldehyde of which they are in part composed. Concerning this disinfectant A. S. Mitchell, chemist for the Wisconsin Dairy and food Commission, made the following statement in Hoard's Dairyman in 1898: During the last year a new and most powerful disinfectant has been foisted upon the market as being harmless, and with the advantage claimed that it could not be detected by chemical means. This substance is formic aldehyde, a substance in general use as a disinfectant and for preserving and hardening dead tissues. Doctors have been obliged to abandon its use as an antiseptic, in a very dilute form, for preserving ear washes and similiar solutions, as continued contact in dilutions as high as 1 to 10,000 causes the skin to die and peel off'.

"The fact that a solution is strong enough to kill bacteria in the milk should be sufficient to deter any intelligent man with a conscience from adding it to that which he sells for human food. Because some of the readers of this article have used Preservaline or Freezene in their milk during the past summer without, to their knowledge, having killed, or injured the health of any of the creamery's customers, is no argument for the continuance of its use. It should not be necessary to prove that the substance will cause direct injury in the doses in which milk is used in order to establish the fact that it is harmful. Many cases of sickness and death have been traced to the presence of chemical preservatives in milk and the citizens of Tucson are at present investigating cases in which death is supposed to have resulted from this cause.

"The laws of twenty-six of our states make this adulteration of milk a crime punishable by a fine or imprisonment.

Unfortnnately our territory has no law providing for the punishment of this crime. All creamery men should, then, be a law unto themselves and, standing together, unrelentingly refuse any milk suspected of having been treated with chemical preservatives or any other form of adulteration.

"The use of chemical preservatives is the unscrupulous man's substitute for care and cleanliness, for by proper handling, milk may be kept sweet until delivered to the factory, even in an Arizona climate. A former Timely Hint dwelt somewhat at length upon the necessity of cleanliness in handling milk and we would not like to emphasize more strongly and specifically the necessity of paying proper attention to cooling the milk.

"One morning in July the writer stood at the weight can of a creamery and took the temperature and tested the acidity of each lot of night's and mixed night's and morning's milk delivered. If these lots of milk had all been handled with equal care as to cleanliness, the temperature at which they had stood through the night, as indicated by that taken at the creamery in the morning, might be reasonobly conaidered as responsible for their acid condition at that time. The temperatures of the night's milk varied from 78 to 93 degrees F., and while the variations in acidity did not conform exactly with those of temperature, generally speaking, the warmer the milk the worse its condition. It is needless to say that the milk at 93 degrees was sour; it was so sour that particles of clabber stuck to the sides of the weight can as the milk was drawn off. and yet, the driver insisted that the milk was sweet and became profanely abusive when the weigher politely told him that the milk in that condition would thereafter be refused. Other lots of milk with a temperature as low as 84 degress were sour, indicating that lack of cleanliness had contributed to their souring.

"As stated before, this condition of affairs is absolutely unnecessary. In our experience at the Experiment Station farm

we have observed that by the use of the ordinary tin drum milk cooler filled with well water, which with us has a temperature of from 70 to73 degrees, milk, may be reduced in temperature ten degrees; that by running it over the cooler a second time the temperature may be brought down five degrees more; and that by wrapping the cans in which the milk stands in wet burlap or gunny sacks the temperature may be still further reduced to that of the atmosphere or lower. During the first fifteen days in July, including the hottest days and nights of the season and the hottest twenty-four hour period recorded since the establishment of the weather bereau in Phoenix, the average temperature of the night's milk in the morning, under this treatment, was 71 degrees, which was less than the average minimum temperature of the atmosphere for that period. On very warm nights the temperature of the milk went several degrees below that of the surrounding air. Under this treatment the increase of acid in the milk during the night was very slight. The average per cent of acid in the milk immediately after milking, during the first ten days in July, was 165 per cent, while the same milk on the following morning showed a presence of only 17 per cent of acid. Milk seldom smells or tastes sour when containing less than 3 per cent of acid.

"With these facts to base conclusions upon we feel safe in stating that, with the exercise of reasonable cleanliness in milking and in the care of utensils, and by taking proper care in cooling, milk may be delivered at the factory in good condition, and that there is no excuse based on reason for what we deem the criminal adulteration of milk by the use of chemical preservatives."

PULSE OF IRRIGATION.

DEEP WELLS.

Mr. S. L. Cary writes from Louisiana to the *Rice Industry*: "Irrigation commenced in southwest Louisiana six or seven years ago with canals, and these are being improved year by year. Three or four years ago a deep well was put down at Mermentau at 148 feet; it proved to be a flowing. Since then one to two hundred deep wells have been put down, water rising to or near the surface. The difficulties of construction were many; the price of tubing has doubled and we are experimenting with substitutes. Glazed and perforated tiling may do, and will lessen the cost considerably. We are now paying two dollars a foot for six inch wells. The average depth, 150 to 180 feet, with five inch pipe and stationary engine will cost, say $1,200, and will flood one hundred acres, possibly two hundred, experience will tell. Larger plants will be more economical. Such wells are being put ten, twenty and fifty feet apart, united just below water level, say ten feet, making anywhere from ten to thirty feet below the surface. Then a large pump and engine can be run by one set of hands night and day as cheaply as the canals for the same lift and capacity. The supply of water is seemingly inexhaustible, the temperature for use for flooding or drinking, generally soft for washing, and mineral enough for a tonic.

The experiment so far seems to be a practical success. The why we want wells is very easily answered. Water is one of the three essentials to successful farming, and a vital essential like the soil, moisture or heat, the successful farmer must own or control. We want wells to make successful farmers and freeholders. Their success is the success of all, and their success depends largely upon the farmer's control of the elements upon his own farm. The length of his growing season, the value of his crops per acre, and his control of the crop conditions on the farm are the great factors in his success, and the success of the rest of the community depends upon his. Here in this prairie region everything seemed to favor the agriculturist, except that at times in the growing season there might be a time too dry for rice, which must be flooded to get best results. A deep well on each farm fills the bill, and will give to Southwest Louisiana the most prosperous farmers in the country.

Wells are used for irrigation in many countries by different people and with varying success. The depth of well, the lift to be made, the quantity and quality of the water, its temperature and the character of the soil and subsoil must all be considered in successful irrigation. National Encyclopedia says: "Many such wells exist in London. Those which form the fountains in Trafalger square descend into the upper chalk to a depth of 393 feet. The most famous artesian well, perhaps, is that of Crenells, in the outskirts of Paris, where the water is brought from the Cault at a depth of 1,798 feet. It yields 516¼ gallons of water a minute, propelled thirty-two feet above the surface; temperature 81⅞ degrees fahrenheit.

"A well in the course of construction at Pesth yielded at a depth of 3,100 feet 17,500 gallons of water a day of a temperature of 161 degrees fahrenheit, projected

thirty-five feet above the surface. One at Sperenburg, Prussia, is 1,462 feet deep."

Wells have been bored in the great Sahara desert. There are seventy-five such wells in one district, 75 degrees fahrenheit, yielding in all 600,000 gallons per hour, with the result that several of these wandering tribes have settled down, constructed villages, planted date-palms and entirely renounced their wandering lives.

Artesian wells have supplied a portion of the data upon which the internal temperature of the earth may be calculated. Being below the zone, affected by the temperature of the seasons, consequently the water is of constant temperature. Thus the Grenelle has a constant temperature of 31 degrees, while the mean temperature of the air in the cellar of the Paris Observatory is only 53 degrees. By a series of very careful experiments it is found that the rise in temperature is ½ degree for each fifty-five feet down to 1,800 feet, than ½ degree for each forty-four feet.

There are several deep wells in the United States, one at St. Louis 3,843 feet; Columbus 1,775 feet; Louisville 2,086 feet, and Charleston, S. C., 1,250 feet.

It is easy to see that the best of these flowing wells would not furnish sufficient water for rice on the scale grown in Southeast Louisiana. The Grenelle, 1,798 feet, only furnishes 516 gallons a minute, while a ten inch well in Louisian furnishes one thousand to fifteen hundred gallons, and a ten inch pump with two to four wells connected, will yield 4.500 gallons per minute. Seventy-five wells in Africa united give 600.000 gallons per hour, while our forty-eight-inch pumps yield 1,000.000 gallons in the same time. Then, our hard clay soil makes it possible to flood so many more acres. The flooding of land with pure water at a constant temperature just right for vegetable growth opens up an almost limitless field for experimenting and practical farming. It lengthens our already long growing season. It provides against disaster, summer or winter. Grasses, the most valuable of nature's blessings, will be increased in variery and quality, semi-tropical fruit trees may find special protection in warm currents of water and consequent vapor air; two crops of rice may be quite possible with early and late irrigation made easy by wells.

Why do we put the wells ten, twenty and fifty feet apart? Because we are experimenting, the idea being that we draw water from a distance and get more. We began with two inch wells, and now six, eight and ten are more used. E. Scharff of Jennings has a ten inch well just put down at Welsh, La., 118 feet, water rising very near the surface, has flooded over ninety acres of rice in six days' pumping. To cover ninety acres four inches deep in six days requires 2,400 gallons of water a minute. It requires 27,139 gallons to cover one acre an inch deep.

Artesian does not necessarily mean flowing, but only water not affected by the surface. Again, these wells make it possible to open up every acre in fertile, valuable farms of the prairie region of Southwest Louisiana and Southeast Texas. Who can imagine the beauty and value of such a country—every acre a garden capable of almost continuous cultivation? This may sound like fiction, but it is only prose of the prosest kind, the reality will require an angel to describe and a Raphael to picture."

EDITORIAL COMMENT.

The irrigation problem is too large for individual initiation. It is a subject that should be handled by the government.—*San Francisco Argonaut*

In his letter to the National Irrigation Congress Governor Roosevelt gave vigorous expression to his sympathy with the movement to preserve the forests and to

make tillable and fertile the now arid region of the West. About the time the governor was writing his letter to the Irrigation Congress there appeared in the *Country Gentlemen*, the leading agricultural paper of New York, an article urging the farmers of that state to oppose all plans for irrigation in the West at government expense, not so much because of the expense as because the reclamation of arid lands of the West would increase the number of competing farmers in the markets, and would thus decrease the profit of the New York farmers. The narrow selfishness of this is disgusting. It is a part, perhaps, of the rank conservatism that would prevent the development of the country.—*Columbus (O.) Dispatch.*

There is no greater necessity for the appropriation of money for the purpose of developing the rivers and harbors of the country than there is for the expenditure of a comparatively small amount of government funds in aiding to bring water upon land that only needs its magic touch to make it fertile and provide new homes for citizens of the nation.—*Butte Miner.*

The necessity of doing something to reclaim arid lands has been slowly filtering through the minds of western legislators for ten years or more. It is time they got together for a united attack upon the house and senate committees that deal with internal improvements. There are enough congressmen from the West, and their mentality and aggressiveness are of sufficient high order to make a stir if they concentrate their energies.—*Spokane (Wash.) Review.*

The reclamation of arid lands is too vast in its scope and objects for private enterprise or even state aid. The government must deal with the problem sooner or later. It alone can prevent a ruinous conflict of interests and conserve the oceans of water uselessly going to waste. —*North Yakima News.*

It would seem to be a good investment for the government from a business standpoint, as well as highly desirable for other reasons. The work is one which private enterprise cannot well undertake. It requires not only a large capital, but absolute control over the head-waters of some of the principal streams of the country and of the region surrounding their sources. Individuals do not possess this, and there are objections to granting it to them. The government, however, can control and maintain it.—*Grand Rapids (Mich.) Press.*

One of the greatest movements of the nineteenth century, one destined to find a successful issue in the early part of the twentieth. When this system becomes general throughout the arid lands of the West, the entire people of this country will share in the prosperous times they will produce. Thousands of home seekers will find homes for themselves and their families. The manufacturers of the East will find a large field for their products and will be enabled to employ more men. These men will consume more of the products of the eastern farmer, and all in all every section and every industry will be greatly developed. — *Shreveport (La.) Times.*

The general subject is one of great importance. Minneapolis and the Northwest are interested in the proposition directly. The larger cultivation of the arid valleys by means of irrigation is sure to be of advantage, not only to the cities and towns in the irrigated districts, which would profit by the increased population and trade, but to the trade centers as well. —*Minneapolis Journal.*

One of the strongest points made in the Chicago Irrigation Convention in favor of government assistance to irrigation, was that it would promote the small farm industry. The irrigated area is peculiarly adapted to small farms and unadapted to bonanza farming. Minnesota lands will

not go a begging whether the arid lands of the West are open to settlement or not, and our reservoir interests can well afford to join hands with the arid lands interests in securing such judicious government aid as may be desired.—*Minneapolis Tribune.*

The subject is one of vast importance, and one of these days we have no doubt will receive favorable consideration and money aid from the government. Tens of thousands of farmers settled upon small but productive farms would add greatly by their labors to the argicultural products of the United States, and would be new, good customers of its manufacturers and merchants.—*Pittsburg Post.*

This work, which is altogether too vast for private enterprise, it is expected the national government will take hold of in the same way that it has spent such enormous sums in river and harbor improvement along the Atlantic seaboard. The immediate benefit, it is expected, will be to the West. In a broad way the benefit will be to the whole country.—*Denver Post.*

The irrigation question is not a sectional one. The East needs more agricultural lands in the West, that its surplus population may find homes. The whole country will be benefited by the increased productiveness of the West. The reclaimed arid lands will support railroads, furnish a market for manufactured products and enable many thousands of Americans to establish homes.—*Minneapolis Times.*

This great work must be prosecuted until the last acre of land and sage brush susceptible of irrigation is brought under the revivifying influence of water. The question may be asked why not allow private capital to carry on the work which it has already commenced. The answer is that private persons cannot control the sources of supply. Another and more convincing reason why the national government should solve the problem, instead of leaving it to individuals and corporations, is that private enterprise has reached its limit. It has on the whole been a losing business. It has failed financially for reasons which would not be operative against the government.—*New York Evening Post.*

It is justly argued that the national government and people outside the arid regions are interested in this movement by reason of the great value that would be added to public lands; the protection of the Mississippi and its tributaries from floods and the vast additions to trade and commerce that will be secured by the upbuilding of the great West.— Editorial correspondence, Evansville, (Ind.) *News.*

The project, if carried out, will be a benefit to the nation. It will add an enormous area of very fertile land to the national domain, which will furnish homes to a vast population. An additional market will be created for our manufacturers, the railroads will be furnished with additional traffic, and the wide gap between the great central valley and the Pacific slope will be bridged over. Hence there is a national aspect to the matter, which renders it entirely proper that congress should take action.—*Toledo Blade.*

This is a great problem and must be carefully considered. It is generally conceded that these lands ought to be reclaimed. But it will be a costly undertaking, and perhaps only the government can undertake it. Moreover, the longer the work is delayed the more difficult it will be to do.—*Philadelphia Press.*

The two general plans that involve all the others are the storage of storm waters and reservoirs and the preservation and extension of the forest. Certainly the success of the Mormons in Utah shows how a desert may be made to bloom by carefully laid plans. The work of the Irrigation Congress is of interest not alone to the farmers of the far West or to those

who have interest in arid sections of the country.—*Philadelphia Enquirer.*

Governor Roosevelt's suggestions appeared sound and sensible, but every one of them turned on the postulate of government control. And the more the problem is studied, the more clearly it will be seen that this is the only way to treat it that promises satisfactory results. The area that must be dealt with is too great to be bounded by state lines, and any practical plan must ignore them. But this brings up the greatest problem in the whole scheme of western irrigation. — *Philadelphia Public Ledger.*

A hundred million acres of good land are unfit for cultivation, and, in fact, for habitation, because the rainfall is not sufficient to insure crops. The national interest that is being manifested in reclaiming this big stretch of arid land shows that work along the right line is progressing rapidly. The expense of putting this land into a profitable agricultural condition of course is very great, but if Uncle Sam gets back of it, and the right men engineer it, there will be but little difficulty in creating a desirable territory for new homes for industrious farmers. — *Drovers' Journal, Chicago.*

As long as fertile, well watered land with virgin soil remained to be exploited, naturally but little interest could be excited over leagues of arid waste known in the earlier geographies as "the great American desert." Now that the public lands in the humid and sub-humid areas are practically all taken up, it is natural and inevitable that the problem of dealing with those neglected portions of territory should call more urgently for solution.—*Chicago News.*

There is an area larger than New York and New England combined, and the opening of it for successful agriculture would add much to the productive capacity of the country. Without doubt the government soon will move in that direction, reclaiming comparatively small tracts from year to year, until the whole territory is brought under cultivation.—*Troy, N. Y. Record.*

Irrigation is the problem upon which hinges the redemption of millions of acres of arid land throughout the western states and territories. Considerable work has been accomplished in this line through the employment of private capital, but if ever proper results are realized the government itself must take hold of the matter.—*St. Louis Star.*

All the West is interested in the plan to have the government build a system of storage reservoirs near the headwaters of streams to use for irrigation purposes. The idea is that private capital might be depended on to distribute the waters to the users. As the government controls rivers, it could appropriately undertake the diversion of superfluous water in the winter and early spring into reservoirs where it could be stored until it should be needed in the spring and summer. The government is the more interested in such work because it would probably end the floods that have caused such loss of life and property. The water which now swells the Missouri and Mississippi to undue proportions at times, would be diverted for use in transforming deserts into gardens.

This new farming community would increase the market for manufactured goods, and would largely add to the agricultural wealth of the land. For both these reasons the East as well as the West is interested in the irrigation development.—*Kansas City Star.*

Congress has taken tentative but inefficient steps to aid irrigation, granting the lands to the states which find themselves unable to bear the burden involved in a large system of irrigation. Money

cannot be raised on them to improve them, but must be invested before they have any value. Every argument that has been made for other national improvements appeals with greater force for this.—*St. Paul Dispatch.*

The question of the reclamation of millions of acres of western lands by irrigation is no longer a sectional issue—it is a national one. It is time that the subject should receive that attention its importance demands.

The reservoir system will prove the solution of this problem, while abolishing floods in the Missouri and Mississippi rivers.

It is a national enterprise and should be so considered.

It is legitimately the work of congress. That body should attend to it.—*St. Louis Chronicle.*

The Irrigation Congress has intrenched itself in the broad principle that it is the duty of the national government to take care of the arid lands, and it will make a vigorous—though not necessarily a last ditch—fight to have congress shoulder the burden.—*Kansas City (Mo.) Journal.*

It is proposed to ask an appropriation of ten million per annum on a "continuous plan," as is recognized in the river and harbor work. For ourselves, we think the possession and occupation of "arid America" more likely to "expand our trade and give us greater strength among the nations" than the acquisition of all China.—*Jacksonville (Fla.) Times Union.*

The first and most immediate benefits would result to agriculture in the use of the water to irrigate the arid lands of the far West. The second result would be the diverting of those flood waters from the Mississippi river, thereby relieving the lowlands of the valley from the inundations they periodically cause without such diversion. While Louisiana has a general interest in the improvement of the entire country, and in the promoting of its agriculture, this state's special interest is in the relief from floods from the great rivers that pour their waters down from the mountains upon the lowlands.—*New Orleans Picayune.*

The national irrigation movement is no longer an experiment. Its annual congresses have increased in size and importance for nine years. The object of carrying the convention East is to awaken eastern interest in the irrigation movement as something which, if successful, opens an extensive new market to eastern manufacturers and jobbers. — *Topeka Capital.*

Slowly but surely the importance of a national system of irrigation is being impressed upon the United States government. The great work being accomplished by irrigation associations, of which the National Irrigation Association is the strongest, will in time be the upbuilding of the arid West. The government must, and will in a few short years, take hold of this important question. — *Paso Robles (Cal.) Record.*

Both political parties have pledged their support to plans for reclaiming the arid lands of the West.

The last year-book of the Department of Agriculture says that private irrigation has practically reached its limit, and that in many instances it is proving a losing business. The reason for this failure would not exist in the case of government operations. Eventually every possible acre of sand and sage brush must be made productive.—*San Jose (Cal.) News.*

Private and State enterprise have already done much to develop the possibilities of some sections. But there are greater problems to be solved, and the members of the irrigation congress are doubtless right in holding that this is

legitimate work for the United States government itself. No one will object if the government spends money to reclaim arid lands for the benefit of bona fide settlers.—*St. Joseph (Mo.) News.*

There are not a few people in various sections of the country, not directly interested in the work of irrigation, who recognize that every reclaimed acre of land means a stimulus to business, and an eventual benefit to the country—means more crops, increased population, advanced civilization, new needs, and consequently a greater volume of business. What congress has to guard against is schemes to benefit mere private enterprises at public expense. A project so guarded will be beneficent, and the people of every section of the country can consistently approve it.—*Springfield (Ill.) Register.*

Capt. H. M. Chittenden, of the Engineer Corps, who has made a careful study of the subject, asserts that there are in this country 75,000,000 acres of arid land which can be reclaimed. This is a territory somewhat larger than New England and New York together. Considering the great fertility of irrigated lands, it will readily be seen that this reclaimed territory would support millions of people, and be a vast addition to the national wealth and resources.—*Boston Herald.*

The project is one which would be of the very greatest benefit, both to the West and the East—to the West as offering homes for not less than 10,000,000 people engaged in farming; to the East in supplying a large home market for manufactures of all kinds, and increasing to a very great extent the wealth and resources of our nation—*Colorado Springs Gazette.*

The day is certainly coming when the public will realize the importance of further developing our land resources. Although the irrigation problem is an old one in many localities, it is comparatively new to the country as a whole. These lands once reclaimed and provided with an adequate water supply, would become among the most fruitful and valuable in the country.—*Sioux City (Ia.) Times.*

There are sufficient and satisfactory reasons for the undertaking this great work of irrigation by the federal government. Private enterprise will undertake schemes that promise early financial returns, but will do little for the permanent benefit of mankind. This great work must be prosecuted until every barren waste of sand and sage brush that is capable of irrigation is made to bloom and blossom like the rose under the vivifying influence of water. It is gratifying to note in the eastern press the assertion that the country will not be satisfied with anything less. —*Tacoma (Wash.) News.*

There is no doubt that any extensive plan for the reclamation of arid lands can be carried on to much better advantage by the general government than by the states which have such lands within their borders. The benefits of so large an addition to the productive area of the country are apparent. Tens of thousands of farmers settled upon small but highly productive farms, would add greatly to the agricultural products of the United States, and would be good customers of its manufacturers.—*Grand Rapids Herald.*

The power and duty of the government to conserve the waters either by forests or reservoirs arise from the fact that upon their preservation depends the very existence of the country. With water we may have in the arid region prosperous communities, populous states and national wealth, resources and power; without water we have deserts, desolation and death.—*Los Angeles Times.*

There is sufficient available water in Spain to reclaim an immense domain. The government decided in May last to con-

struct reservoirs and irrigation canals to enlarge her agricultural area. Certainly our country ought not to be behind poor, old unenterprising Spain in bringing under cultivation her arid fields. — *Salt Lake Tribune.*

What would be accomplished were the national government to undertake the gigantic work of constructing reservoirs and canals on a scale necessary to bring the entire arid region under cultivation can best be judged from the transformation that has taken place where only a few years ago the lizard reigned almost supreme in his realm of burning desert. The platform (Irrigation Congress) recommends "adequate national legislation reserving control of the distribution of water for irrigation to the respective states and territories." This should insure prompt action on any feasible plan that may be brought to the attention of congress.—*Salt Lake City News.*

THE RESURRECTION DAY.

By Martha Capps Oliver.

Blue and cloudlike, in the distance,
Stretched the Gallilean sea,
Tender skies above seemed brooding
Over some glad prophecy;
Reaching out across the future,—
Brightening all the world's dark way,—
Hope and promise gave their pledges
On the Resurrection Day.

From the hills of far Judea
Swept a tide of joyful song,
Rocks and trees caught up the chorus
As it swelled and rolled along;
All the earth laughed out in rapture,
Flowers blossomed by the way,
Even Gethsemane's sad garden
Bloomed on Resurrection Day.

Still on Gallilean waters
Shines the sunlight as of old,
Still within that sacred garden
Flowers their fragrant hearts unfold;
Still from nature's holy places
Wandering odors find their way,
While a rapture pure and subtle
Thrills through Resurrection Day.

"Peace be with you," said the Savior,
And the benediction sweet—
Floatidg down the breath of ages—
Waits our longing souls to greet;
Jesus, while Thy gentle presence
Lingers yet beside our way,
Snines toe glory, still reflected,
From the Resurrection Day.

ODDS AND ENDS.

WHAT SHE WANTED.

A huckster was going along on an east side street early one morning, making the welkin ring with his sing-song of "Po-ta-t-o-o-o-es, toma-t-o-o-es. Nice sweet cooking appools." As he drove slowly along he lifted his eyes to the windows on either side of the street.

Suddenly there appeared a woman's head at a window in one of the top flats. The huckster pulled in his horse and raised his ear to listen to the commands he expected would be coming. But the woman had not the lung power to make her voice carry so far, and the huckster called out: "How's that?"

Again the woman called out and her voice came down faintly. The huckster didn't know whether she wanted potatoes, cantaloupes, tomatoes or corn. So he marked the fourth flat from the corner and motioned that he would drive around to the alley. The woman was there waiting for him and called out once more, but he couldn't understand her.

Gathering a handful of samples of various vegetables from his stock he mounted four flights of back stairs and arrived at the top panting. The woman stood there awaiting his coming.

"Couldn't hear what you said, lady," said the huckster, "so I brought up some of each kind an' you can pick what you want an' I'll go down an' get 'em."

"Want?" said the woman, who was in a towering rage. "Want? I don't want none of your old vegetables. What I want is for you to stop hollerin' in front of this house, or I'll have you arrested. You're enough to wake the dead. My husband works all night and he's just got into a little doze, and goodness knows it's hard enough to sleep daytimes such weather as this without a fiend like you standing in front of the house yelling like a Comanche. Now you get out of here and don't you holler no more or I'll get the police after you."

The huckster stood with set eyes and drooping jaw, the perspiration dropping off his chin, while the harangue was going on. When she had finished he came out of his trance, and said:

"Is that what you called me all the way up here for? Send fer yer p'lice, lady; I'm goin' to yell to beat the band." And he went down the stairs and out of the alley and up the street in front of the house with four extra links let out of his throat. And if any person slept on that street it was under the influence of opiates.—*Kansas City Star.*

FEMALE LABOR.

The report which comes from Richmond to the effect that influence is to be brought to bear upon the wives and daughters of workingmen to confine their own labors to the sphere of their homes, giving up the places in the factories which many hold, is rather interesting. It is to be presumed that these wives and daughters do not labor in mills and factories merely because, though having a competence, they prefer even meagerly paid employment to luxurious idleness, but that they are at work, because if they did not work they would suffer in some particular, or in many particulars, in such a

way as to make life considerably less worth the living. The query is as to what the agitators of the discontinuence of employment on the part of these industriously disposed persons intend to substitute as a means of furnishing the objects of their dissuasion with that which they now secure by honorable labor. It can hardly be expected that any enthusiasm which can possibly be excited in favor of the abstract proposition that wives and daughters should not work in factories will, all alone by itself, satisfactorily fill the place of substantial clothing and nourishing food. It is philanthropy or selfishness that is engaging this crusade against female labor in Southern mills?

SPOILING A HORSE.

The following satirical suggestions are made by the *Journal of Medicine* on "How to Spoil a Horse."

If you have occasion to stop on the street either do not tie the horse at all, or tie him to something to take with him if he wants to get away. If the weather is chilly it will toughen him to leave him uncovered; but should you choose to blanket him, throw the blanket over him so loosely that the first breeze will turn it over his head.

A cold wind blowing on the chest of a heated horse will refresh him greatly, and if he stands in the gutter with melted snow and ice running around his heels, so much the better.

When you return to the stable let the horse cover the last few rods at the top of his speed, and pull him up with a loud triumphant "Whoa?"

And now don't miss the glorious opportunity of trying the disposition of the animal. Unfasten all the attaching straps but one hold-back, and start the horse out of the shafts. When you see the result yell like a fiend. The strap that remains unfastened will first make the shafts punch him in the stomach.

Then pull all the harness off his back. If he does not kick it is a sign he is a good horse—there is no wild horse in him.

If it is winter and the horse much heated, either leave him in the stable unblanketed, or put the blanket on at once and leave it on, wet, all night.

A draught of cold air from the opening above the manger to the door behind, blowing the whole length of his body, will help to season him. If it is summer slop his joints with cold water and give him a couple of swallows to drink—a couple means any number, from two to a hundred.

If the horse is tired and exhausted do not forget to feed him at once. He might starve to death if you left him for an hour. A heavy feed of corn will please him greatly, and a generous allowance of corn meal will make him look nice and fat—probably before morning.

A liberal dose of ginger, pepper or "condition powders" will scare away any evil spirits that may be hovering about, and make everything all right.

If the horse is not dead by the next morning you can fix him up at your leisure, and thereafter conscientiously recommend him as "tough." But should he be so unreasonable as to die during the night, you can console yourself with the reflection that it was not your fault—the animal was constitutionally weak.

LARGEST MACHINE EVER SHIPPED OVER THE OCEAN.

The largest piece of machinery ever exported from this or any country, has just been shipped to one of the principal iron works in Germany.

It is a boring machine, capable of boring cylinders no less than 20 feet in

diameter. The spindle is 12 inches in diameter. The machine has a center elevation of 10 feet from the face of the bed plate. All the movement is controlled by belt power.

This monster machine weighs over 160,000 pounds, and cost $15,000.

UTTER IDIOT.

Indianapolis Journal: She—Why should they say stolen kisses are the sweetest?

He—I think it is due largely to the natural perversity of human nature. It is not so much due to the fact of any sweetness in the mere performance of oseulation as to an inherent desire for that which is supposed to be unattainable. Now, for instance, I read an article by an eminent sociologist on the——."

"It is getting real chilly out here on the porch. I think we had better go in the house."

ABENDROTH & ROOT MFG. CO., N. Y. ELECTION OF OFFICERS.

At the Anuual meeting of the above named Company the following officers were elected: Mr. Linus G. Reed, President; Mr. H. C. Kelley, Vice-President; Mr. F. W. P. Brunig, Secretary and Treasurer. This completes the reorganization instituted a year ago, and carries with it an association both of thorough factory and engineering equipment, also a Department of Sales which is full abreast of 20th Century methods.

There was once a wise king who was awfully curious. He was possessed of a desire to know everything, and was continually asking questions. Indeed, his thirst for knowledge carried him so far that he wanted to know the age of every person he met. But, being a king, he was exceedingly polite, and would resort to stategy to gain his ends.

One day there came to the court a gray-haired professor, who amused the king greatly. He told the monarch a number of things that he never knew before, and the king was delighted. But finally it came to the point when the ruler wanted to know the age of the professor, so he thought of a mathematical problem.

"Ahem?" said the king. "I have an interesting sum for you; it is a trial in mental arithmetic. Think of the number of the month of your birth."

Now, the professor was 60 years old, and had been born two days before Christmas, so he thought of 12 December being the twelfth month.

"Yes," said the professor.

"Multiply it by 2," continued the king.

"Yes."

"Add 5."

"Yes," answered the professor, doing so.

"Now multiply that by 50."

"Yes,"

"Add your age."

"Yes,"

"Subtract 365"

"Yes."

"Add 115."

"Yes"

"And now, said the king, "might I ask what the result is?"

"Twelve hundred and sixty," replied the professor, wonderingly.

"Thank you was the king's response.

"So you were born in December, sixty years ago, eh?"

"Why, how in the world do you know?" cried the professor.

"Why," retorted the king, "from your answer—1260. The month of your birth was the twelfth and the last two figures give your age."

"Ha, ha, ha!" laughed the professor. "Capital idea. I'll try it on the next person I meet. It's such a polite way of finding out people's ages."—*New Ideas.*

WITH OUR EXCHANGES.

The charming "Cranford" folks have been written into a play, and make their appearance in the February *Ladies' Home Journal.* Even more dramatic is "The Beautiful Daughter of Aaron Burr," with her romance, her supreme happiness and crushing sorrows all crowded into a few years. "The Clock by Which We Set All Our Watches," "The Buffaloes of Goodnight Ranch," "A Woman to Whom Fame Came After Death," "The Life of the English Girl," are features of interest. The last of "The Blue River Stories" is published in the February journal, and "The Story of a Young Man" is nearing its conclusion, while "The Success of Mary the First" increases in humorous interest. "Is the Newspaper Office the Place for a Girl?" is the theme of. Edgar Bok's editorial symposium, which is made peculiarly convincing by the opinions of editors and newspaper women. Caroline Leslie Field writes of "The Problem of the Boy;" Helen Watterson Moody, "The Trying Time Between Mother and Daughter, and "An American Mother," "Why One Man Succeeds and His Brother Fails." "A Home in a Prairie Town" and a "Brick and Shingle Farmhouse" give architectural plans and detail.

THE FORUM.

Of the fourteen articles in the February *Forum*, the one entitled "The Rehabilitation of the Democratic Party," by "An ex-Democrat," will, perhaps attaact the widest atttention. In his article, Nationalization of the State Guards," Gen. T. M. Anderson advocates a judicious combination of our regular and volunteer establishments. Hon. William Dudley Foulke contributes an article entitled "The Spellbinders," a narrative of the trials of stump speakers in the heat of political campaigns, which is replete with humorous anecdotes. The Lessons of the Election—A Rejoinder," by Willis J. Abbot, is a reply from a Democratic standpoint to Mr. Heath's article, "Lessons of the Champaign," published in the *Forum* for December. Mr. Kelly Miller, the eminent negro scholar, a leader of his race, writes about "The Negro and Education." "The Status of Porto Ricans in Our Polity," by Stephan Pfeil, is a discussion of the vexatious question of the citizenship of the residents of our recently acquired possession, Porto Rico. Mr. James G. Whitely, a leading authority on international law, has an article on the "Monroe Doctrine and the Hay-Pauncefote Treaty." "Should Woman's Education Differ from Man's?" is a dicussion of coeducation by no less an authority than Charles F. Thwing, President of Western Reserve University and Adelbert College. Mr. Walter Macarthur's article on "The American Trade-Unions and Compulsory Abitration," treats of the labor question, and the proposed innovation of compulsory arbitrtiaon. "The Dark in Literature," by Richard Burton, Professor of Literature, University of Minnesota, deals with the sombre, the brutal, the terrible—the abnoamal elements of life—as reflected in masterpieces of poetry and the drama.

MC CLURE'S.

McClure's Magazine for February will contain a character study, "Croker," by William Allen White, in which this brilliant writer analyzes Tammany's leader and declares the secrets of his power. Also "In the World of Graft."

Professor Ira Remsen, LL. D., will contribute on account of some "Unsolved Problems of Chemistry."

A narrative of Hernando de Soto and his discovery of the Mississippi, by Cyrus Townsend Brady, will be fully illustrated.

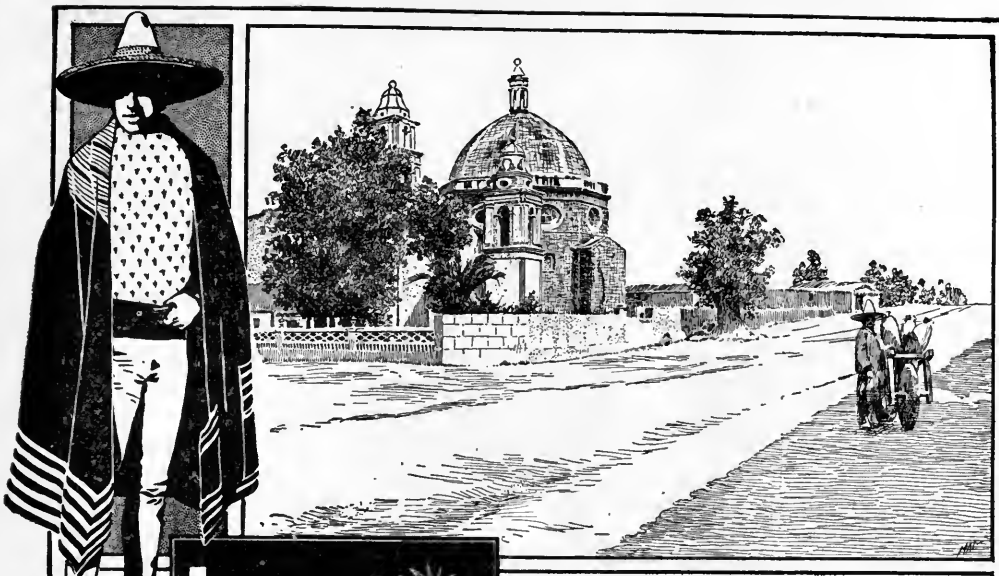
"Some Recollections of John Wilkes Booth," is the title for a personal memoir of Lincoln's assasin by Clara Morris.

The authors represented are Rudyard Kipling, Robert Barr, Sarah Orne Jewett, Josephine Dodge Daskam, and Edwin Lefevre; the artists are Kenyon Cox, Edmund J. Sullivan, Lockwood Kipling, Edwin Lord Weeks, Genevieve Cowles, Charles L. Hinton, Henry Hutt, George Gibbs, and Frederic Dorr Steele.

THE SATURDAY EVENING POST.

A dozen of the wealthiest capitalists in the country—men who wield absolute control over immense business enterprises—will tell the readers of *The Saturday Evening Post* (February 16) why they remain in the race which they have already won.

Each of them writes frankly whether he makes money for his own sake, for the sheer joy of working, or to gain the power with which vast capital invests itself.



THE IRON MOUNTAIN ROUTE.

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RICHARD YATES, GOVERNOR OF ILLINOIS.

THE IRRIGATION AGE.

VOL. XV. CHICAGO, MARCH, 1901. NO. 6

Irrigation In Russia. National irrigation is being pushed by Russia. The government contemplates undertaking large irrigation works in western Siberia. In the districts of Tomsk and Omsk alone no less than 833 artesian wells have been bored during the last four years at a cost of $300,000. Furthermore, there have been constructed in the government of Tomsk, in 74 different districts, altogether 276 miles of canals, while 85 miles of river beds were cleaned from mud, thus reclaiming through irrigation large areas of country.

Egyptian Reservoirs. It is reported that but for the improvement effected recently in irrigation in Egypt, the unprecedented failure in the Nile flood this year would have caused greatly increased damage to the Egyptian cotton crop. All the fine, long staple cotton in Egypt is raised under irrigation. The construction on the "Nile reservoirs" is pushing forward rapidly toward completion, and the low Nile of 1899-1900 has greatly facilitated the work. Ten thousand men are now employed at Assouan and ten thousand more on the lower river at the Assiout reservoir. Twenty thousand men laboring on storage reservoirs in the arid region of the United States would mean the winning of a new West.

A Western Fight. Some hundred prominent daily Eastern newspapers recently have editorially expressed views favorable to a system of national irrigation. It would seem that the East is well in line in wishing the development and reclamation of the great area west of the hundredth meridian, and that it is realized that such a development would benefit the entire country and be a national benefit, adding to the general wealth and power of the Nation. While the East is thus willing to assist and co-operate, it expects, of course, that the West will make its own fight. Every local Western organization of whatever character—chambers of commerce, clubs, business associations—everything with a president and a secretary should discuss and take action upon this question of national irrigation and Government appropriations for the building of storage reservoirs, and then stand ready to co-operate with the National Association, for whatever proeedure is necessary.

Ornamental Plank. It was somewhat contradictory to hear Representative Mondell, of Wyoming, urging the reclamation of the arid lands, in the house of representatives, and in invoking the arid land reclamation plank of the Philadelphia republican platform, and "Uncle" Joe Cannon, of Illinoia, and Representative Grosvenor, of Ohio, repudiating this plank as "ornamental," not binding, etc. If the eastern republicans of the house are not very careful and do not soon wake up to the situation, they will get into an embarrassing tangle over the arid land irrigation question, which is growing stronger and stronger with each day.

The opportunity was just right in the house, had the democrats as a whole been alive to the situation and to the strength of the irrigation question, for the democratic party to place the republicans in a bad predicament, for the key-note of the Western irrigation question is "home-building," and the republican party has heretofore always championed this class

of settlement. The demacrats, by now favoring this idea themselves of providing homes in the west for thousands of American citizens, could with entire consistency charge the republicans with having forsaken their old-time policy for that of colony-building.

Irrigated Homes. In the irrigation debate in the house of representatives Representative Bell, of Colorado, stated that he had served on a special committee which went to the arid west to investigate conditions of labor and capital, and that they found in Utah the best labor conditions of anywhere in the United States.

"Why," he said, "did we find there the best condition of labor? The reason given was that the men employed in the coal mines and in the metalliferous mines and everywhere else had small homes on this irrigated land. and whenever there was a shortage of work the miners of Utah went to their little homes and cultivated their land. A family can raise more on one acre of good fertile irrigated land, in my judgment, than can be raised on an average of three or four acres in the Eastern states. This condition quadruples the inducement for laboring men to make homes on this land, and causes them to take a lively interest in their reclamation."

For Small Settlers. Congress is beginning to recognize that the national irrigation propaganda is not a scheme to irrigate vast tracts of private lands at public expense thereby putting money into the hands of speculators and those already well able to take care of themselves; but that it comtemplates the reclamation and putting upon the land of *bona fide* settlers —home-builders. When this idea becomes firmly grounded in the minds of Eastern men—that the land is not to be reclaimed and then jobbed away in large tracts, but that it is to be safe-guarded so that it will become available for the small settlers who wants to take up forty or eighty acres, and build a home upon it and stick his plow into the soil and let the water follow his furrow, then there will be very little opposition to storing, by the Government, of the flood waters of the West, so as to make it available for such use.

Such a policy carried out would people the arid West with the same class of hardy citizens as the early pioneers who settled the great Mississippi valley, carving out for themselves and their children, homes in the wilderness, and making and creating their living and prosperity from the soil.

Tolstoy, Farmer and Philosopher. The cables bring us the sad intelligence that Count Leo Tolstoy, the military leader who abhors war, the landlord who believes the present holding of land in private ownership to be wrong in every way, the nobleman who dresses in the garb of the humblest peasant, the literateur and art critic, who plows his fields and cobbles his own shoes—the cables tell us that this wonderful and good man is dead at his home farm, Yasnaya Polyana. Russia.

Perhaps no better idea of the character and order of mind and heart of this man has been given to us than that which Edward A. Steiner contributes when, in Farm and Fireside, he describes a recent visit to the great humanitarian, and repeats his interview with the greatest writer and thinker, perhaps that Russia ever has given to the world. Of the farm and its relations to life, Count Tolstoy said to Mr. Steiner:

"The truly happy life can be lived only on the farm, away from the struggles of the markets, content with what the earth brings forth, living upon God's bounty, asking nothing of men and giving them everything they need. Tell your farmers and farmers' sons," continued the great thinker, "to cling to the soil, to live simply, purely and lovingly. Tell them not to forsake the country because they are lonely; there is no loneliness like the loneliness of the city, and there is no sweeter companionship than that which they may have with God in the field. Tell them that labor alone enobles, and that obedience to Christ's law alone brings salvation. There is no greator curse than money, and there is no greater blessing than to live the Christ-life."

Who, witnessing the strife and selfishness of the modern commercial spirit, but hopes that some day the world, following out that divinely instituted order—first the simple, then the complex, then a return to the simple—will return, like some weary prodigal, to the arms of the great Earth-mother, glad to be at peace with itself once more and engaged in the whole

some and enobling employment of drawing sustenance from her bosom? This is what the Russian prophet sees, and he urges the farmer to stay on his farm, the truest and best mode of life.

We hear much of political or state socialism in these days—and we must be careful to say state socialism, when we mean this order, for many of the best people in the world favor great social changes who utterly abhor the idea of state socialism. Tolstoy evidently is one of these, for when Mr. Steiner asked him, "Isn't socialism a preparation for an ideal state? Tolstoy replied with much spirit:

"No, indeed not; it is just the contrary. It will regulate everything—put everything under law. It will destroy the individual; it will enslave him. Socialism begins at the wrong end. You cannot organize anything until you have individuals. You are making chaos instead of cosmos. You will breed terrorism and confusion which only brute force will be able to quell. Socialism begins to regulate the world away from itself. You must make yourself right before the world around you can be made right. No matter how wrongly the world deals with you, if you are right the world will not harm you, and you may bring it to your way of thinking. The modern labor leader wishes to liberate the masses while he himself is a slave."

Mr. Steiner concludes his interesting and valuable account by saying: "I could gather no points on 'how to farm' on Count Tolstoy's estate—we far surpass him in that; but he might teach us, as he has taught me, 'how to live.' "

IRRIGATION IN THE PHILLIPINES.

MANY VALUABLE LANDS IN CONDITION FOR DEVELOPMENT.

By G. D. Rice.

The writer arrived in the Philippine Islands at the outbreak of the war and after two years sojourn through the principal islands has concluded that there are some very excellent opportunities here for the development of the rice, tobacco, cocoanut, and other lands if properly irrigated. There are vast tracts of uncultivated lands in all of the islands, many of which appear to have no owners other than the few native squatters who have built little bamboo and nipa shacks upon them. There is no doubt that much of this land could be turned to profitable advantage in the raising of the tropical products. There are certain periods of the year when there are abundant rainfall and no irrigation is required. This season lasts from July to the middle of winter. The remainder of the year is very dry. I recollect that the first year I was here that not a drop of rain fell in the valleys of the southern islands of the group from Christmas to July. The earth was baked hard and all farming products dried up. I saw places where hundreds of acres of products could have been saved if properly irrigated. I noticed that the native farmers strove hard to save their crops by weak irrigation. At some places they hauled water for a mile or more in bamboo buckets or caribo drag sleds. In this way they would manage to keep a small portion of the lands irrigated, but the greater part of the crops would go to ruin, being sun burned. I saw women and children carrying water day after day to save farm crops all through the months of March, April and May. This carrying of water is tedious work and the labor expended would not pay, only that the ruling rates of wages here for farm labor is only about ten cents per day. Thousands of acres of crops which are ruined every year through the dry season could be saved with irrigation, and it is possible to irrigate the plantations of the Phillippines for the reason that most of them are situated in the low valleys. There are numerous water supplies in the mountains and these could be tapped for the water and the same carried to the points desired through piping. The scheme has been worked successfully in many sections, and I saw that the natives were using bamboo piping for the purpose. The hollow bamboo is slipped one end over the other and a secure union made by means of wrapping with hemp.

In some places the native farmers were irrigating by means of deep sunken wells, but this is a tedious work as the water has to be elevated about 100 feet from below the surface. The ground becomes very hard and dry in the course of two or three months sunning without moisture, and the little water which the natives are able to apply counts for hardly nothing.

SYSTEMS OF UNDERGROUND STONE PIPING.

I observed that on some of the plantations they were using water-corrying systems built up by using sand stone piping. This sand stone of the Philippines is soft enough to permit hollowing into pipe form with crude tools and it makes a good water conductor. Again I saw soap stone pipes. There are strata of soap stone in the country among the clay deposits and some has been located by the coal miners. The stone is useful to irrigating farmers for making pipes. The potters of the islands also make piping which is being used by the farmers. This form of piping is perforated with holes and the water oozes out at different points.

DEVELOPMENT OF THE FARMS.

There are very large plantations of rice, tobacco, sugar cane, chocolate, coffee, peanuts and other products in these islands awaiting proper development by irrigation. At present many of the plantations are in a state of idleness owing to the continuance of dryness which might be overcome if the water supplies of the country were properly utilized. The sugar lands of the country are very promising and there are chances for Americans and others to make considerable money at this work alone. I have seen abandoned sugar plantations which might be worked to advantage if under proper management, which are for sale at almost nothing. I know of discharged soldiers who have bought up deserted sugar works and plantation and engaged in the business with trained overseers in charge, and who have made money the first year. There are hundreds of idle sugar grinding mills distributed throughout the country which were deserted at the beginning of the present war. In many cases the ladrones and free booters of the islands have played havoc with the machinery by removing the brass work and salable parts, but in most instances the steam plant and the grinding machinery can be put into working shape at slight cost. I have observed fully equipped steam plants, with good boilers, engines, pumps and grinding and conveying machinery abandoned in the islands, and ready for some claimant, the property having evidently belonged to one of the insurgents, who either lost his life in battle, was captured, or ran away, not daring to present himself as the owner of the plant. Such plants have been taken up by first comers, the lands properly irrigated, the cane crop produced and harvested, the grinding machinery put into order, and money made in large amounts.

It has been due largely to antiquated machinery that the sugar interests of the islands have never paid as they should. Even under the conditions which existed for years previous to the war, the sugar mill owners made very large amounts of money. I have stopped for weeks with some of them, and their homes are fitted with modern conveniences, the sons and daughters have been educated in Spanish schools, one hears piano playing, and there are indications of general prosperity. Then one may go to the sugar mill and there find the source of revenue for the family to consist of a broken down old shack in which animal traction is the power, and in which naked natives are employed at sugar making after the crudest of style. Yet these sugar mills have been and are now little gold mines to the owners, and many of the proprietors are immensely rich and spend much of their time with their families traveling abroad. With such good profits on the sugar cane crop under the crude methods used, the opportunity for increasing the profits by using modern machinery would be very great. There is a good future of sugar growing in the islands, and the most important advancement will be made when better systems of irrigation are introduced.

COFFEE PLANTATIONS AWAITING IRRIGATION.

The first operations in the Philippines towards the development of the coffee plantations should be in the direction of irrigation. The writer rode for many days through coffee lands which were in bad condition and partly abandoned because of the extra dryness of the season, while in the mountains nearby there were many pools of water, formed by numerous brooks, which might be utilized if the proper apparatus were employed.

In taking up new coffee lands in the islands the natives clear away the undergrowth, and the coffee berry is planted and some sort of shade is arranged for, as the full power of the hot tropical sun would destroy many of the young plants. The next season the plants are arranged in rows with alleys between. As the plants attain growth the poorest are thinned out. Coffee raising in the Philippines has paid some of the larger investors extremely well. I know of some recent comers who have made considerable money by starting plantations and afterwards selling them at high values.

In some of the plantations on the island of Panay they have arranged for irrigating the lands by pumping water from the rivers by means of crudely designed windmills. The mills are made something after the style of the old mills employed 100 years ago for turning the grinding rolls of flour mills. At one place the water raising device was erected from a series of buckets arranged to be run up full of water from the river and back empty by means of animal traction. All sorts of water-lifting devices are employed. There were few good pumps in service, although I saw some which had been imported from

Spain. The water is raised from the river lever to reservoirs, and from the latter it is conveyed by means of bamboo pipes or home-made stone or clay pipes to the fields where the water is distributed to best advantage in the rows of coffee plants.

MILES OF TOBACCO.

I rode through miles of tobacco country on Luzon, in the valley of Cagayan. When modern methods of irrigation, machinery and management are introduced the tobacco crops of this section of the Philippines will not only be doubled but improved in grade. This valley is drained by many streams emptying into the Rio Grande de Cagayan. In this valley the river forms the natural irrigation for a good portion of the year. The dry portion is what should be looked out for, and this could be arranged if there were proper equipments available. The rainy season this river overflowed the entire valley and the plantations were submerged. When the river gradually settled to its former level, a deposit of rich residue remained which greatly improved the soil and made the following crop exceedingly profitable. The plowing and breaking of the soil begins in October. During December, January, February and March the dryness of the season is felt and it is during this period that artificial irrigation is needed. There are hundreds of natives employed in this valley and thousands of Chinese coolie labor. Many Americans and other foreigners are engaged in the tobacco growing interests here, and all suffer from lack of rain for the plantations during the dry season. During this dryness many of the workmen are thrown out of occupation, and if there were means for introducing irrigating establishments, these men would be available for service in putting in plant and piping.

CHOCOLATE.

The Philippines have been noted for the cocoa bean for many years. There are large plantations in operation at the present time, on which tons of the cocoa bean are produced yearly. In addition to the wholesale production of cocoa, there are very many families who devote a portion of their lands to the private raising of the cocoa bean.

The extensive farms which have been planted from year to year have in many instances proved failures due to the lack of regular and proper irrigation. Some foreign capitalists undertook to go into the cocoa bean raising business on Panay island a short while ago, and much money was invested in laying out the plantation and putting in the needed equipment of tools and machinery. The first year was an unusually dry one and the enterprise failed. Other instances might be noted of a like character. The climate is particularly adapted for the growing of the cocoa bean and very many housewives earn considerable money by having small patches of the plant about their homes. The cocoa bean is gathered in the shell in the fall and is spread in the sun to dry. Next comes the baking, after which the

grinding is done. During the grinding of the substance some of the chocolate makers add sufficient sugar to sweeten the article, making it useful for commercial purposes. There is a great future for chocolate production in the Philippines, and when the problem of irrigation for the dry lands during the dry season is solved, there will be some good opportunities for the investment of capital in this line of products.

PEANUTS.

There are also large and uncultivated peanut farms in the Philippines. For some reason the Philippinos labor under the belief that the peanut groves of the islands do not require much attention, and they give no time or work to the care of the same, except when it is time to collect the fruit. The peanuts as grown here now are small and inferior, but could readily be developed into a staple and superior fruit. The peanut lands are very wild in appearance, showing little indication of civilization. The native peanut collectors live in bamboo and nipa shacks near the peanut farms and during the harvesting collect the peanuts in large mats. These mats are spread in the sun so that the peanuts can dry out thoroughly, after which they are sacked and shipped to the nearest market. The market places of the country thrive in nearly all of the cities and towns, and the products of the plantations are sent to these places for purposes of selling. The prices obtained for the peanuts are very low, and it would pay enterprising individuals to employ agents to go about the country buying up peanuts and shipping them to some of the sea ports, there for sacking and shipment to other countries.

ORANGES.

Orange groves are everywhere, most of them thriving without any attention on the part of the proprietors of the lands. One may traverse for long distances through great orange-laden trees and not see a native. This is during the period of growth. As soon as the fruit begins to ripen the different owners of the lands appear and commence to gather the fruits. These native appear to expect that the groves will yield abundantly even though no attention is given to the irrigation or care of the trees. The majority of oranges of the islands have an acidity property which could be gradually worked off by proper cultivation.

LEMONS.

Lemons are somewhat scarce in the Philippines, due to the inferiority of the grade produced. The only trouble with the species of lemons grown in the Philippines is that the fruit is shrunken and small, due to utter lack of cultivation and care for many years. The Filippino lemon grove owners have done little else than collect the fruit. Often they do not go to the trouble of doing even this much, and the hogs of the country subsist upon the growth.

MANGOES.

The mango farms of the Philippines are among the important features of interest. These great, rich farms would be very profitable if the natives knew how to handle the crops to advantage. The fruit is sweet and nourishing and is eaten by foreigners to a large degree. The shipment of the fruit to Japan and other countries has been carried on recently with good returns. The native labor, however, is shiftless, and the fruits are often rendered inferior by the crude methods of labor used. One of the first steps towards the improvement of the Philippine farms by irrigation and cultivation should be the introduction of tool with which to work. One will see farmers down on their hands and knees turning the soil with crude wood devices. The plows are all wood and inferior in workmanship. There ought to be a large number of plows sent here as well as general farming tools and machinery. Some of the poorly paying plantations could be turned to profitable account if this were done.

FEDERAL IRRIGATION TALK.

AN INTERESTING STATEMENT ON THE SUBJECT OF INTERIOR.

By Secretary Hitchcock.

One-third of the whole area of the United States, exclusive of Alaska and the outlying possessions, consists of vacant public lands open for entry and settlement under the homestead act. This one-third includes some of the richest agricultural lands of the world, capable of producing enormous crops under the influence of an almost cloudless sky. There is one obstacle, however, which prevents its utilization, and this is the scarcity of water at certain times and seasons.

There is a considerable amount of water throughout this vast extent of public lands, but it is so situated or distributed that artificial means must be provided for conserving the floods and distributing the needed supply to the thirsty lands. When this is done there will be opportunities for thousands or even for millions of homes within the portion of the United States now almost uninhabitable. The creation of these homes would add enormously to the material wealth of the nation and the utilization of this vast area as farming land will in no way reduce the value of the lands now cultivated. The crops produced within the arid regions are entirely distinct in their nature from those of the humid east, and seek other markets. More than this, the possible population of the country west of the Mississippi will vastly enhance the volume of trade and manufacture throughout the rest of the country, and will make more valuable the productive areas adjacent to the great manufacturing centers of the east.

* * *

In my annual report I have given a general estimate of the extent of the public lands and of the irrigable area. In round numbers it may be said that nearly six hundred million acres of land remain west of the Mississippi river. There is water sufficient for the reclaimation of at least 74,000,000 acres. A still larger area can probably be brought under cultivation through the complete conservation of floods and pumping of waters from underground. This, however, can be accomplished only through a wise system of laws providing for an administration of the lands in accordance with their available water supply. By wise action the many millions of acres can be made capable of supporting a great population, but by neglect but a small portion of this land can be utilized.

That this vast acreage, capable of sustaining and comfortably supporting under a proper system of irrigation, a population of at least 50,000,000 people, should remain practically a desert is not in harmony

with the progressive spirit of the age or in keeping with the possibilities of the future.

What can be accomplished depends upon the varying conditions in each of the localities named, and what should be attempted also depends upon the returns to be expected. In other words, the fundamental question is whether it would pay to store and control the storm and flood waters, which, by proper irrigation, may add increased wealth and provide happy homes for willing workers.

The average cost per acre of a properly constructed irrigation system necessarily varies and depends upon local conditions. The remarkable results, however, accomplished in the valley of the Nile in practically redeeming Egypt from a state of bankruptcy should encourage a most liberal consideration of the question of irrigation. It is desirable that such reasonable expenditures be made by the Federal government, as well as by the States, as will gradually, but as rapidly as possible, insure the blessings consequent upon a well-defined and executed system of irrigation.

* * *

Under a joint resolution of March 20, 1888, directing the Secretary of the Interior to make an investigation of that portion of the arid lands of the United States where agriculture is carried on by means of irrigation, as to the natural advantages for the storage of water for irrigation purposes, with the practicability of constructing reservoirs, together with the capacity of the streams and the cost of construction and the capacity of reservoirs, and such other facts as bear on the question of storage of water for irrigating purposes, a number of reservoir sites were selected and approved by the department.

These sites were intended to be used in connection with a general plan of execution under the control and supervision of the United States. No appropriation has as yet been made by Congress for the inauguration of such a system, but provision has been made for the gauging of the streams and determining the water supply of the United States, including the investigation of underground currents and artesian wells in the arid and semi-arid regions; and the results of such investigation, which has been conducted under the supervision of the director of the geological survey, have been brought to the attention of Congress through the medium of reports, in which the best methods of utilizing the water resources of the arid and semi-arid sections are set forth.

The importance of the reclamation and utilization of the arid public domain has attracted greater attention during the past year than at any previous time. A large correspondence has arisen in the different bureaus throughout the department, and especially with the geological survey, which, through its hydrographic branch, has been ac-

cumulating data bearing upon the water supply, the location of reservoir sites, and the methods and cost of bringing water to the land.

* * *

The interest of the public is manifested in a practical way by the formation of associations in different parts of the countty in its water and forests. Large sums of money have been subscribed for dissemination of information concerning these waters, and also for co-operation with various bureaus, notably the hydrographic branch of the geological survey. The appropriation for this latter office was increased by the last Congress from $50,000 to $100,000, and this sum has been further enlarged by popular subscription, as just noted. A still further increase commensurate with the importance of the subject is being urged by commercial organizations and firms and by citizens who have contributed their funds to the furtherance of this work.

Developments of irrigation have proceeded almost wholly along the lines of building small individual ditches and co-operative ditches. The opportunities for extending and multiplying these are, however, limited, as the lands most easily accessible for water supply have already passed into the possession of individuals. There remain large bodies of public land for which water can be obtained only at a great expense, although the cost per acre may not exceed that of the small systems. Further extension of the irrigable area rests in the building of great storage reservoirs and canals.

* * *

Progress in the construction of these large works of reclaimation has come practically to a standstill, as it has been found by experience and shown by statistics that these reclaimation works have not been made a source of individual profit. Capital has been induced to undertake the construction of such works in different parts of the West, but almost without exception these have been financial failures, while the small co-operative ditches built by the land owners have been conspicuously successful. The large works, while sources of loss to their owners, have, on the other hand, been of great advantage to the committees and to the State as well as to the nation, but it is improbable that investors will continue as a philanthropic enterprise.

The cause of financial failures of these works of reclamation has been in the fact that the owners cannot secure to themselves the increase in value which has taken place directly or indirectly through the building of the works. In some respects the case is comparable to that of a city whose harbor has been improved. The land values are increased, but the work if carried out by private enterprise may not be remunerative to the builders. It is evident that if further reclaimation is to take place it must be through Govermental action.

The importance of providing under wise administration homes for many millions of citizens is so great that some steps should be taken toward completing our knowledge of the extent to which the arid lands may be redeemed.

EDUCATING THE EAST.

By Col. H. B. Maxson, Secretary.

For the first eight years of its life the National Irrigation Congress met annually in the West. The attendance at its sessions was largely composed of representative men of the West, and every phase of the great problem of the reclaimation and settlement of arid America was discussed and considered in its deliberations.

At the Eighth Annual Session, held at Missoula, Montana, it was decided to hold the next session of the Congress in Chicago. The reason for this was that the West had practically become united in favor of the adoption of a broad national policy for the preservation of the forests and the storage of the floods.

The subject was then brought before the people of the East through their commercial organizations. The merchants of Los Angeles began the work by correspondence with several thousand of the Eastern merchants and manufacturers who find a market for their goods in the city of Los Angeles, a city which is such a magnificent object lesson of the marvelous transformation that water will work in the West.

The merchants of St. Paul and of Omaha next took up the work of organization through correspondence with their business connections throughout the East, and a large number of the leading merchants and manufacturers of the great city of Chicago have extended to the movement their strong influence and support, and have likewise taken up the matter by correspondence with other Eastern merchants and manufacturers.

As a result of this work the membership of the National Irrigation Association now comprises nearly one thousand of the leading mercantile firms and manufacturing concerns of the United States, and has a membership extending from California to Maine, and from Minnesota to Texas. Agricultural, commercial, horticultural and labor organizations, from one end of the country to the other, have strongly endorsed the national irrigation movement by resolutions, and given to it their earnest aid and co-operation.

Through a gradual evolution national irrigation has finally crystallized into a movement which is essentially national in its broadest sense, and the organizations that are now enlisting in the cause are

not promoting it from any local or sectional point of view, but from the conviction that the planting of American civilization and the building of homes for one hundred million new citizens under the American flag in places which are now waste and desolate is a national purpose, which demands support from citizen and statesman, from merchant and manufacturer, from farmer and factory operative, and from every class of the people and section of the country, because the far reaching and widespread benefits from the reclaimation of this vast area of virgin territory would create a new national prosperity in which all would share.

To the newspapers of the country is largely due the credit for the remarkable progress which the national irrigation movement has made, because, without regard to party or section, the almost unanimous and united support of the press has been given to the movement.

The great political parties of the country in their platforms in the last campaign both endorsed it, and hence the movement is in no sense partisan or political. It rises to the highest and the purest patriotism, and the motto of the movement, "Save the forests and store the floods," is one in which every citizen, no matter to what political party he may belong, may enlist and fight as a soldier in the cause of the conquest and subjugation of the deserts of arid America.

THE FOREST AND THE STREAM.

LETTER FROM HON. JAMES WILSON, SECRETARY OF AGRICULTURE, READ BEFORE THE NATIONAL IRRIGATION CONGRESS AT CHICAGO.

Pressure of official duties prevents my presence at your Congress, and I am exceedingly sorry. It would give me great pleasure to meet you, and to discuss the two great agricultural problems of the West—wood and water. But the work of preparing my annual report keeps me in Washington, where I hope I shall not be less useful to your cause than I should be if I came to Chicago.

The Department will be represented by several of its scientists, and to what they will have to say I invite your special attention. Through its search for economic plants that will thrive with little water, through its studies in the use of water for plants that need more, through its soil investigation, its forest work, and in many other ways, the Department of Agriculture is working at the problems which you are met to consider. These problems are national in their scope, and it is most fitting that they should be studied by the agencies of the National government.

The water and forest problems are essentially and primarily ones of conservation and use. The waste of water in floods and the waste of forests by fire are parallel losses, each contrary to the best interests of the nation at large, and each preventable by well-known means. "Save the Forests and Store the Floods" is an appropriate motto for your Congress.

The vast developments which you are planning can become permanent only by the junction of wise conservation with energy; and the natural resources, which have cost you nothing, must be protected and husbanded with the same trained care which you are making ready to bestow upon vast systems of artificial works for irrigation.

The chief dangers which threaten your plans—one the failure to secure the building of these great works, the other the failure to protect the forests from which your waters come—are best met, like most of the dangers which threaten our country, by the broad diffusion of wise principles and ways of thought among the people. The two sister organizations which are striving for the objects you have in view, The National Irrigation Association and the American Forestry Asso-

ciation, are perhaps the most useful agents at your command for this purpose. Use and support them to the full, and see to it that in every city, town and village, East and West, the people understand the vital interest of the whole nation in the protection and wise use of the forest and the stream.

IRRIGATION RESOURCES.

"Exclusive of Alaska and outlying possessions," said Mr. F. H. Newell, Hydrographer of the Geological Survey, in speaking of what is possible in the United States in the way of irrigation reclamation, "one-third of the whold United States is vacant and at the disposal of Congress. For the most part it is open to homestead entry and settlement, and much of it consists of land possessing great fertility except for the lack of water. In different sections are to be found mountain masses from which come perennial streams whose waters are now used to some extent to moisten the parched lands. At intervals there occur local storms or floods inundating large tracts. There is available water for the reclamation of a considerable portion of this arid land if it could all be saved and put to use.

"Work has been undertaken by individuals and by corporations to construct ditches, canals and reservoirs to supply the lack of moisture. As a rule the smaller works taking water from perennial streams have been not only successful, but sources of great profit to the owners; the larger works, however, almost equally without exception, have proven financial failures and their owners have become bankrupt. The great works, built in the hope of securing a certain and permanent revenue drawn from the farmer, have impoverished the owners, and the latter unwillingly have become benefactors of the public.

"The lesson is being slowly but certainly taught that reclamation on a large scale cannot be made a source of profit except under extraordinary combination of circumstances. The great storage reservoirs and canals are comparable in one sense to lighthouses and harbor improvements; they are necessary and worth far more than they cost, but under the existing state of civilization they cannot be made to contribute exclusively to the welfare of the builders. The indirect gain or unearned increment of value is so widely diffused that the general public reaps the larger reward.

"We are confronted with a situation," concluded Mr. Newell, "where there is a vast amount of fertile land to be reclaimed and considerable quantities of water to be conserved and brought to this thirsty land. By such action millions of homes can be created and the com-

monwealth enormously strengthened by the addition of a producing population where each head of family owns and lives upon his farm. To bring about this happy result it is impossible to trust to speculative enterprise, because of the fact that profits cannot be made in the construction of a work unless the population becomes tenants of a great land-owning monopoly."

Public funds must be wisely used in the construction of works of reclamation, and this will surely come about when the people of the country are fully conversant with the facts. These facts are being obtained by the investigations of the United States Geological Survey in the water resources of the country and the extent to which the arid lands can be redeemed by irrigation. The Survey is doing excellent work.

GUY E. MITCHELL.

THE DIVERSIFIED FARM.

In diversified farming by irrigation lies the salvation of agriculture.

PEACH CULTURE.

The peach growing districts of the United States are somewhat limited and the crop is never equal to the market demand. This insures goo pdrices and makes the business of growing peaches very profitable. In many of the districts of the western states peaches return an average of $400 to $600 yearly from an acre. Some successful growers report having harvested as high as $1000. annually from well established peach orchards. The trees usually stand about fourteen feet apart making at least 160 good trees on an acre. These bear from five to twenty boxes each and the market seldom falls below fifty cents a box.

Peaches can be grown for family use in almost every state, but for planting a commercial orchard the soil, climate and market conditions should be favorable. The trees will stand cold weather, making a succecs in New York, Michigan, and all of the northwest states. The site should be protected as much as possible from cold winter exposure and where the winds will not have a strong force in destroying the limbs Thin, sandy and rocky soils will give very good peach crops but it always pays best to fertilize the lands. At planting time the land should be fertililed by using plenty of potash, phosphoric acid and nitrogen, and annual applications will prove beneficial.

There are several choice varities of peaches for early medium and late crops. In planting an orchard one must bear in mind that fruits must be of good size, fine color, excellent flavor and suitable for shipping some distance and being displayed on fruit stands. The old tested varieties should therefore be selected and planted in preference to some new species that may have only imaginary qualities. Alexander Amsden, Rovers, Troth, Hale, Louis. St. John, Mountain Rose, Crawford Early, Foseer, Old Mixon, Stump, Elderta, Crawford Late, Reeves, Wager, Fox Seedling and Beers Smock are probably the best for all seasons. Full descriptions of each may be found in the nurserymen's price lists, that every peach grower should have.

The new idea of planting closely and pruning the trees low and bunchy seems to be the most profitable. Trees may be had from nurserymen in sections near where an orchard is to be planted, thus insuring that they are acclimated. Two year old trees are generally preferred as they have better roots and can be pruned properly. Peaches are heavy consumers of plant food and therefore if the quantity is expected to be large and quality good. liberal doses of fertilizers must pe annually applied; the most economical plan is to furnish the nitrogen by growing clover or cow peas between the rows the Potash and Phosphoric Acid can be applied before the peas or clover are sown and worked in well; about 250 lbs. Muriate of Potash and 400 lbs. Acid Phosphate per acre would make a fair application. Besides the nitrogen furnished the peas or clover keep the land well supplied with organic matter, which is an important matter.

Peaches are generally marketed in boxes weighing twenty pounds each. These sell on the market for from fifty cents to $2.00 according to the demand for the fruits. They should be neatly packed and of a uniform size and color. The orchard may be made a success several miles from a large city, if good transportation facilities are at hand. If the peaches are hauled

very far in wagons they should be packed tightly in the bed and the wagon have springs to prevent too much brusing. A little over-ripeness may result in spoiling a box for market. It is necessary that every specimen be solid when picked and placed in the box. The surplus if any after all the markets have been supplied may be evaporated, canned made into jellies or even into peach brandy, all of which finds a ready sale on every market.

The peach tree has several enemies and must be cared for or it will soon become unprofitable. The orchard should be cleanly cultivated every year for at least six seasons after planting. Such crops as peas, hairy vetch, red clover and similar food collecting plants are food for the peach. The crops are harvested and weeds and objectionable plants are kept down. The San Jose scale may be killed by spraying with a mixture prepared expressly for that purpose. The borers and yellows are treated by special means that may be obtained from any books necessary for guidance in his work before planting a commercial orchard.

JOEL SHOEMAKER.

PREPARING CORN FOR PLANTING.

A. S. McCallen, writes in Orange Judd Farmer. "The belief that anybody can grow corn is a fallacy and I have witnessed efforts almost as primitive as those of the Indians, who plowed the ground with a stick and left the crop to be taken care of by nature. Any yield of corn less than 30 bu per acre is poor, 30 to 50 bu is fair, and 50 to 70 bu is only good, while 60 to 100 bu is easily possible. To obtain a good yield with favorable climatic conditions, the following must be well understood and intelligently treated: Soil, preparation of seed bed, seed planting and cultivation, I will try to present briefly the correct elementary knowledge, derived from my own experience and the experience of others, upon all these subjects but the last, reserving that for a later article.

Corn is one crop that cannot be overfed. The plant is a great feeder and will not thrive where only quack grass and bull nettles flourish. If your land is poor don't plant it in corn with the idea of building it up. Soil that is too poor to grow a fair crop of potatoes should never be planted to corn unless in the course of crop rotation to prepare for some other crops which may build up the soil.

When to plow for corn will depend upon the kind of land. If it is sod land or new land that has never been plowed, it is better to plow it during the fall or early winter, than prepare for planting with disk or pulverizing harrow. Replowing in the spring, fall or winter plowed land would give best results. With any other kind of land start the plow as early in April as the soil is in prime condition for plowing, which is when the particles are dry enough to separate readily under the pressure of turning the furrow. Never plow when the soil is wet and sticky. It is better to be a few days or weeks later in the planting than to plow the land wet.

Lay off the land with a view to drainage and ease in doing the work. If the fields are rolling, so that open furrows are not necessary for drainage, make but few and fill these in harrowing.

Plow deep while the sluggard sleeps, and you shall have corn to sell and to keep, is a good rule for the corn grower. Most soils should be plowed six to eight inches deep. The object is to form a deep bed of loose earth in which the roots of the corn may feed and obtain moisture during the season of growth. It is important that the plowing should be well done. Cut no more soil than the plow will turn and have the furrows clean and straight. Put every thing on the surface out of sight.

Harrow, drag, or otherwise pulverize the surface when dry enough to work well without sticking, and do not be satisfie

until your field is level and in condition for a potato patch. Decide on what variety or varieties of corn you will grow and be guided in your selection by the demands of your market, the yield and the feeding value of the different varieties. Select sound well matured ears of uniform size and color, remembering the law of nature is, that like begets like. Any farmer can steadily improve the quality and increase the yield by selecting the best specimens of a certain type of corn he wishes to grow.

As a rule the earliest planting makes the best corn. The planting, however, should be delayed until the seedbed is warm enough to readily germinate the grains and frosts are scarcely to be expected. From April 20 to May 20 covers the period when corn should be planted, although earlier or later plantings may sometimes do equally well. Shallow planting will give the best results. The corn will come up better and quicker and will make a better growth. One to one and one half inches is about the right depth. It is a mistake that deep rooting of the corn plants depends on deep planting. If the seedbed is rightly prepared the corn roots will take care of themselves. If there is lack of moisture at time of planting a greater depth may be necessary.

It doesn't pay to get in a hurry when preparing to plant corn. I mean by this it doesn't pay to leave anything undone that ought to be done in order to gain time that you may beat your neighbors.

Tests made by agri exper stas have generally resulted in more bushels of corn per acre from planting in drills 16 to18 in. apart, than planting in hills. In these tests, however, the cultivation has been very thorough, so that the drilled corn had as good a chance as that planted in hills. The greater ease and thoroughness of cultivating corn checked or planted in hills is much in favor of that method of planting. The better method for most farmers is that of checked-rowing or planting so as to admit of cultivation two ways. I think about the only reason most farmers have for drilling their corn is that is more easily and quickly done than checking.

Do the easy and the rapid methods of farming always pay? Let each corn grower as he plans his work for the coming season which marks the first year in the new century destined to be greater than all the past, decide to practice intensive cul ture with this great staple of American agri not more acres but more bushels."

RENTING THE FARM.

The old farmer who has moved into town to please his family and because he has a vague notion that he ought to retire is often a pathetic sight. His occupation is gone, and with it the interests of a life time. He enters a new environment and feels himself shrinking in importance as the days go by. With the removal of all obligations to busy himself, he often falls into the habit of doing nothing a good share of the time, and hugs the chimney corner when he is not gossiping with old cronies at the village store. He grows old rapidly and from being a man of some distinction in the community he rapidly deteriorates into the class of superfluous individuals who contribute nothing to society. Such is not necessarily the fate of all men who retire from the active management of farms, but it occurs frequently enough to afford plenty of examples. One wonders why they are so easily persuaded to relinquish an active life, yet the reasons are abundant enough if one takes the trouble to investigate. Perhaps the children are growing up and clamor for greater scholastic advantages than the district school affords, and better society. They unite to persuade pa that he is getting old, that he needs a rest and that he ought to rent the farm and move to town where Jack may eventually secure a clerical position and Mary le arn dressmaking. His life has seemed to him

monotonous and filled with hardships, and he, too, thinks a change would be agreeable. So he rents the farm but he never feels like a man among men after. In later years when the farm has deteriorated under a succession of tenants and has finally been sold for half its value, when the pleasures of clerical life have begun to pall, Jack enviously thinks of the good old times on the farm, and wishes he had not been so eager to sell his birthright. The man who removes with his family to the village but who continues to superintend the work on his farm or farms, is in a very different situation. For him life loses none of its interest. He has a sense of security in the thought that in adversity there is always the farm to fall back upon.

Some agriculturists claim, however that no man can farm profitably at long range, that is, after he has ceased to reside on the farm. We are not prepared to yield the point in the face of some conspicuous example to the contrary, but if we admit it for the sake of argument the case against the farmer who abandons his farm is the stronger. Would it nor pay better in the end to employ more help and to provide horses to convey his children to and from the high school and places of amusement, or better yet send them to college, but keep their home and its associations unchanged. A telephone is an easy and comparatively cheap vehicle of communication which any farmer who is rich enough to retire can well afford, and there are many luxuries possible to the farm home that will not only make it tolerable to young people, but attractive. Those who have had even a slight acquaintance with frontier farmers who usually live five or ten miles from a railroad, will acknowledge that among them were some of the most sociable people they ever knew, people who knew how to entertain and be entertained. The hospitality of the south in ante-bellum days, and the social intercourse between plantations many miles apart, made that part of our country famous.

A social disposition will find opportun ties even on a farm and it seems a pity to exchange its independence and freedom and the beautiful associations of a life so close to the heart of nature, for what often proves to be a more cramped and less healthy existence in town.

It is natural and right that the farmer who has satisfied his material ambitions should thenceforward desire to take life easier, but there is a vast difference between resting and rusting.—*Farmer's Review.*

OPENING OKLAHOMA RESERVATIONS.

The announcement that considerable Indian land will be thrown open for settlement in So Okla has resulted in a great deal of inquiry. The opening of these reservations is of course in the hands of the U. S. dept of interior. It seems that the land to be thrown open to settlers forms a part of the Comanche, Kiowa and Apache reservations. It is situated in the extreme southern part of the territory on the boundary of Tex. and consists of about 3,000,000 acres. There are 3000 Indians, each of which will receive 160 acres. Then 480,000 acres more are to be reserved for grazing land for common use of the red men. The remainder, about 1,560,000 acres, will be offered to settlers under the general land law. Any citizen who has not already taken advantages of the homestead act can secure 160 acres by living on it from five to seven years and making certain improvements, or by paying $1.25 per acre, as is always the case. Honorably discharged soldiers and sailors have the first choice.

The demand for farms in this section seems to be very great, if the letters of inquiry coming in are any indications. An attempt will be made to parcel out farms so that every acre will be occupied by actual settlers. The dept. of interio

will attempt to prevent the disorder which usually accompanies the opening of new lands. It was expected that the reservations would be opened about July of this year, but according to a recent act of congress the allotment to the Indians did not begin until Dec. of last year and not end until Aug of '01. As this tract cannot be opened until six months after the end of the allotment poriod, it is now pretty certain that the opening will not occur until late in the spring of '02. As the dept. of interior has charge of this work. those interested should write to Sec. Hitchcock, Washington, D. C., for full particulars.

DIVISION OF FORESTRY.

The Division of Forestry of the U. S. Department of Agriculture has selected from its working force two trained lumbermen with some knowledge of forestry, to be sent to the Philippine Islands in compliance wilh a cable request of the Taft Philippine Commission. The persons selected for this work are Mr. Grant Bruce, formerly a State forester in New York, and Mr. Edward Hamilton. Both of these men are expert lumbermen with some training in forestry. and have been selected in view of their special fitness for the Philippine work.

A bureau of forestry was established in the Phillippines in April, 1900, with Capt. George P. Ahern, Ninth United States Infantry, in charge. The work of this Bureau has convinced the Taft Commission of the great importance of the timber lands as a natural source of wealth and of the necessity of putting the Bureau on a substantial footing and handling these woodlands under scientific forest methods. Furthermore, it is evident that the cutting of timber under proper regulations will provide a large and increasing annual revenue to the Government. It has been found necessary to permit the cutting of timber to supply the present pressing needs. but care has been taken at the same time that the cutting should be done in a manner that would work no injury to the future growth of the forests. These considerations led the commission to cable to Washington for trained foresters to assist in putting the service on a more satisfactory footing.

Under the Spanish adminstration the timber lands of the Philippine Islands were in charge of a Department of Forestry which was organized in 1863. The personnel of this Department was made up of expert foresters, rangers, clerks, draughtsmen, etc., the higher officials being selected from the Spanish Corps of Engineers.

After Capt Ahern was appointed he received authority to employ a small number of foresters, rangers, and clerks; by September his office force had been doubled: in order to handle the work of the Bureau properly. The call for activity on the part of those in charge of the Bureau of Forestry was emphasized at once by the lumber famine in Manila and other important towns, owing to the destruction of buildings in the war, and the increased demand for good dwelling houses resulting from the large influx of Americans. For these reasons the felling of trees and the marketing of lumber had to begin soon after the establishment of the Bureau. Captain Ahern is in constant communication with the Division of Forestry, for assistance and cooperation with the Philippine Bureau of Forestry.

The work of that Bureau was confined for some months to the Island of Luzon, but recently has been carried to other points in the Archipelago. The present plan of the Bureau is to cover all the important forests as the development of the working force will permit. One great drawback which is retarding the work of the Bureau, is the lack of capable and active subordinate officials. It is diffiicult to find men familiar with the forest conditions and the uses of the woods of the

Philippines, who are entirely satisfactory in other respects. It is believed that the best means of securing a competent and efficient force is to employ new men and train them on the ground as speedily as possible. In this work Messrs. Bruce and Hamilton will be able to render valuable assistance.

The Bureau was recently reorganized so as to consist of an officer in charge, an inspector, a botanist, chief clerk, and stenographer a translator, a law clerk, a record clerk, 10 assistant foresters and 30 rangers. It is the intention of the officer in charge to work up a forest service on the lines of the work carried on in the U. S. Department of Agriculture, through its Division of Forestry. The wholesale destruction of timber will be stopped, and the cutting will proceed under regulations looking to the future yields of the forests. The fire question will receive close attention.

Captain Ahern, in a recent report, calls attention to several obstacles in the way of immediate success in lumbering in the Philippine Islands, the most serious drawbacks being lack of good roads and skilled labor. Forest roads and river driveways are almost unknown, and present methods of lumbering are slow and expensive. The natives, he finds, are not skilled workmen, and though receiving very low wages, their work is found by no means cheap when one considers the cost of felling and hauling a cubic foot of timber to the shipping point.

The forest lands of the Philippine Islands, it is estimated by Captain Ahern, cover 40,000 acres; larger in extent and greater in value than the forests of India. There are 385 species of timber-producing trees, and about 50 more species as yet unclassified. Included in the above list are very hard woods, capable of taking a beautiful polish: woods that resist climatic influences and the attack of white ants; still others that are especially suited for sea-piling or for use as railroad ties. There are many varities of trees producing valuable gums, oils, and drugs; rubber and gutta-percha are abundant in Mindanao and Tawi-Tawi; while at least 17 dye-woods are found within the limits of the Archipelago. Cocoanut palms grow without care or cultivation throughout the Islands. There are also many varieties of palms, bamboo, canes, and rattan which are of commercial value and will afford profitable employment to native labor.

Mr. Bruce and Mr. Hamilton have sailed from San Francisco for Manila on the transport Indiana.

PULSE OF IRRIGATION.

GOVERNMENT BUILDING OFFICIALS MAKING WATER RECORDS.

Prof. Elwood Mead, who for the past two years has been the Government expert in charge of the work of irrigation experiments, is in Washington and will remain there during the remainder of the winter. While there he will have charge of the issuance of various reports of his department, material for which was gathered during the last season in the field. In speaking of the work of the irrigation investigations, Prof. Mead says that two general lines of investigation are being pursued. First, the study of laws and institutions relating to irrigation in different regions; and, second, the determination of the actual use made of the irrigation waters.

This work is clearly differentiated from that of the geological survey, which deals with the determination of the water supply of steam gaugings, and the location of reservoir sites by topographical surveys. The survey deals with questions of irrigation above the canal; this office deals with those below the canal. That is, the Department of Agriculture deals with the distribution of water and its use by farmers and horticulturists. Every effort is made to avoid duplicating the work of the survey. In several States this office is working alongside the survey, and a definite field of work is being covered by each agency. Work has been done or is in progress this year in seventeen States and Territories.

Arizona—Measurements of the duty of water in the Salt River valley by a special agent and in co-operation with the Arizona experiment stations.

California—A comprehensive study of the water rights, irrigation laws and practices, and the distribution and duty of water on eight typical streams in different parts of the State, as follows: Salinas river, San Joaquin river, Yuba river, Los Angeles river, Susan river, Sweetwater river and Cache river.

This work is conducted by special agents of the department, and in co-operation with the California Water and Forest Association, the University of California and Leland Stanford University. The California Water and Forest Association has contributed over $5000 to these investigations. This is the most comprehensive investigation regarding irrigation laws, customs and conditions which has been undertaken in this country. A report on this work is now ready for publication.

* * *

Colorado—A report on the rights of water from the Big Thompson river, showing how water rights are established and protected in Colorado by the State engineer, and a study of the system of the storage of water on the Poudre river, by a special agent of the department.

Hawaii—A report on the irrigation system of Hawaii by the director of the Hawaiian experiment station.

Idaho—Measurements of the duty of water on canals in southern Idaho, in co-operation with the State engineer's office.

Montana—Measurements of the duty of water on canals in different parts of Montana, and special experiments regarding the amount of water required by different

crops, in co-operation with the Montana experiment station.

Nebraska—Measurements of the duty of water, in co-operation with the Nebraska experiment station.

Nevada—A study of the water-right system in Nevada and measurements of the duty of water, in co-operation with the Nevada experiment station.

New Mexico—Studies of the duty of water in Pecos valley and Mosilla Park, in co-operation with the New Mexican Irrigation Commission and experiment station.

Texas—A study of the amount and character of the sediment deposited by irrigation water in the canals and ditches in co-operation with the Texas Agricultural college. Observations of this kind are being made in several States, but the work is all in charge of the Texas agent

Utah—Investigation of the distribution and use of water from the Jordan river and tributaries and the Weber river by special agent of the department and in co-operation with the State engineer and the city engineer of Salt Lake. This is a great enterprise, in which the State and city are co-operating financially.

Washington—Measurements of the duty of water in the Yakima valley in co-operation with the Washington Agricultural college.

Wyoming—Measurements of the duty of water and study of losses from evaporation and seepage by special agents of the department and in co operation with the Wyoming experiment station.

Missouri—Practical trials to determine the usefulness of irrigation in co-operation with the Missouri Agricultural Experiment station.

New Jersey—A study of the practical results of attempts at irrigation already made in New Jersey, and experiments with reference to the extension of this work in co-operation with the New Jersey Agricultural Experiment station. A recent report on this work shows that irrigation has been profitably employed by a number of practical farmers and truck-growers.

South Carolina—Experiments in irrigation in connection with the experiments in tea culture at Summerville under the direction of this department.

Wisconsin—Experiments to determine the usefulness of irrigation in a wide area of sandy lands in northern Wisconsin in co-operation with the Wisconsin experiment station.

* * *

The plans for the work during the coming year include additional investigations in California and Utah. The investigations so far have been only in restricted regions in different States and Territories. It is desired that the scope of the investigations be extended on the duty of water and water rights. It is also desired to extend the investigations to the humid region, continuing and developing enterprises already begun and adding studies with a view to improving irrigation and the culture of rice and other crops in South Carolina and Louisiana. Also to extend the work so that the irrigation systems of foreign countries may be studied with a view to utilizing the results of their experiments in our irrigated regions. It is also desired that the problem involving drainage should be studied. Drainage systems and laws are already needed in our irrigated regions. These should be based upon the experience already obtained in some of our prairie States and elsewhere.

MEEKS AND DALEY DITCH.

The San Bernardino Transcript reports that the owner of the Meeks and Daley ditch, which starts at Colton and runs down through the Agua Mansa neighborhood, are preparing to enlarge the ditch in order to make room for more water, or rather intended to do so before Judge Campbell granted a temporary injunction,

as the result of a suit which was filed by P. J. Stockman and Olive A. Byrne, executors of the will of Matthew A. Byrne, deceased, against W. E. Pedley et al. The ditch, which runs through lands of the plaintiff, has a capacity of 850 inches, and the owners are proceeding to enlarge it in order that it may carry an additional 400 inches of water. The plaintiffs claim that they will suffer great injury by the defendants tearing up large quantities of land upon either side of the ditch. They have also cut off the plaintiff's supply of water, which they use to irrigate the alfalfa. Besides the injunction, the plaintiffs ask for damages to the amount of $500.

A VALENTINE.

By Martha Capps Oliver.

Alack-a-day! when hearts are cold
And naught but love can warm them,
And trusty bolts have barred them fast
That no device may storm them,
What chance has Cupid but to wait—
Although in terror quaking,
To watch for some unguarded point,
A secret entrance making.

Alack-a-day! when he has gained
Admittance through some portal,
What chance of flight, or safe escape
Has any helpless mortal?
For Cupid scatters tinder round,
'Tis made of smiles and glances—
And sets his torch of love a-light,
As slyly he advances.

Alack-a-day! the mischief's done—
And *how*, there is no telling,
No word, was said, no step was heard
Within the heart's lone dwelling;
For what are bolts, and what are bars,
And resolute resistance—
For Cupid always has his way
And wins by sheer persistance.

Alack-a-day! for worse and worse
The plight is ever growing,—
The heart no more contends with fate,
The flame of love is glowing.
Heigho! the fires are roaring now,
Still higher, brighter, faster,
The seige was long—the end was sure,
For Cupid will be master!

HELEN WADSWORTH YATES.

HELEN WADSWORTH YATES.

The recent quadrennial elections which carried into office the Hon. Richard Yates as governor of Illinois, carried also into the executive mansion a charming woman, his wife. Of Mrs. Helen Wadsworth Yates, the new first lady of Illinois, little is now known by the general public because her husband is a new figure on the larger political horizon. Previous to her accession to the dignity of the first lady of the state, Mrs. Yates led a quiet domestic life in her delightful Jacksonville home. She is now in the fierce light that beats about the life of political leaders and the public in general, and the women of Illinois especially are interested in her.

Mrs. Yates is fitted by education, training and distinguished lineage to grace the proud position she holds, and before her four years as mistress of the executive mansion are over she will add another bright page to its history which other brilliant women before her have helped to make. Those who have come in touch with Mrs. Yates and felt the genial warmth of her generous nature, who know her tact and have perceived her strong mental grasp upon affairs feel that she will add strength as only an able woman can to the administration that has begun so auspiciously for her distinguished husband.

Americans are proud to boast that here a man stands upon his own feet and that distinguished ancestry cannot put a man into position his own merits cannot win. This is true. But the pride of ancestry is as strong within our breasts as among the aristocrats of the old world, and we point with pride to those numerous examples among our men of prominence where the strength and power of race has extended from generation to generation. Gov. Yates, the son of a governor, comes of no more distinguished line than his wife, who traces her ancestry back through successive generations of men distinguished in every line of endeavor to a strong old Puritan who came to America when the persecution of Cromwell's Ironsides made England too small to hold them, and beyond him through English sires to the time when another, and the first known, fighting Wadsworth won a crest at the battle of Aquicourt. Something of the spirit that induced that stout warrior to write upon his shield *Aquila non captat muscas*, "the eagle does not catch flies," has stirred every later generation of Wadsworth, who have never stooped to small things.

The first of Mrs. Yates' family to land in America were William and Archibald Wadsworth who landed in Boston harbor some time prior to 1632. William became a man of prominence in the colony and from him Mrs. Yates' family descended. The descendants of William and Archibald successively took their places in the young country as men of affairs and helped to make its history. When the Revolution came on the Wadsworths took their place in the army and added luster

to the family name. Among those who rose to high rank was Mrs. Yates' great-grandfather, General Elijah Wadsworth. About this time another of the family was president of Harvard college.

When the first tide of emigration set toward the great West, the Wadsworths were among those who came to battle with all the hardships of pioneer life. Edward Wadsworth, grandfather of the wife of the present governor, settled in Ohio and served as captain in an Ohio regiment in the war of 1812. The warlike strain was in all their veins to such an extent that some of the family were to be found wherever fighting was to be done. When Decatur humbled the Tripolitan pirates Lieut. Henry Wadsworth, a youth of nineteen, lost his life in the attack. Another patriot of the family was Gen. James D. Wadsworth of Geneseo, N. Y., a millionaire, a philanthropist and a patron of the arts. When the Civil War came on he first outfitted a ship of supplies and presented it to the government and then offered his services in any capacity. Made a brigadier general in 1861 he fought with great dash and courage until a bullet at the battle of the Wilderness ended his brilliant and patriotic career.

In all the long line of distinguished sons of the Wadsworth blood the one whose fame has gone the broadest and who has writ his name the highest on the scroll of honor, the nations great poet Henry Wadsworth Longfellow stands first. His mother was a daughter of Gen. Peleg Wadsworth and the poet's middle name was for his mother's family. Thus the author of Evangeline was a cousin not far removed of Mrs. Richard Yates.

Archibald Clark Wadsworth, Mrs. Yates' father was born in Ohio and moved to Jacksonville at an early age. There he engaged in business, and there his whole life has been spent. In 1848 he married Delia Witherby, a member of an old Vermont family. The Wadsworth family always has been prominent in the commercial and social life of their home town. There in 1865 the present governor's wife was born.

Mrs. Yates received her education at the Illinois Womans' College, one of the numerous educational institutions of a city which takes pride in styling itself the Athens of Illinois. Taking a high rank in the intellectual pursuits of the school, Mrs. Yates graduated to take her place in the social life of her home city. Nor did the duties of society banish her interest in deeper things. She at once became interested in those questions that are agitating educated and progressive women today, and became an earnest member of several clubs devoted to the pursuit of what is best in literary, musical and economic lines. The Wednesday Musical Club, Household Science Club and the Jacksonville branch of the Daughters of the Revolution claim Mrs. Yates as a member. In the clubs she was a gifted and earnest worker, in society she was talented and popu-

lar. In 1888 she was married to Richard Yates then a young lawyer struggling for a foothold in his profession. As a matron Mrs. Yates became a leader and the Yates home in Jacksonville was noted for its delightful hospitality and the charm of its quiet refinement. Two daughters have come to add to cares and joys, Catharine, aged nine, and Dorothy, aged five. Today there is not a happier nor more interesting family circle in the state than the one that occupies the highest position in Illinois political life.

DOROTHY AND CATHERINE.

In the pomp and ceremony attending the inauguration of Gov. Yates last month there was a pleasing family picture that touched tenderly upon the heart strings of everyone who witnessed it. Grouped around the young incoming governor sat his beautiful wife and two pretty children and the proud mother who had sat on that same platform forty years before holding him in her lap while his father was inducted into office. The younger of the governor's children did not understand the nature of the long program that was conferring honor upon her lather and dreadfully boring her. Finally childish impatience could stand the strain no longer and she

began to cry for "papa to stop reading and go home with her." But papa couldn't just then stop unfolding his plans for the government of the state and it was not until grandma's fan became of startling interest that the little one's eyes were dried.

An unusual sight that presented itself during the inauguration was the presence upon the stage of no less than four ex-governor's wives. Around Mrs. Yates sat her mother-in-law, the wife of the first Gov. Richard Yates, Mrs. Tanner, wife of the outgoing governor, and Mrs. Oglesby and Mrs. Fifer.

At the governor's reception in the evening at the executive mansion Mrs. Yates made her first appearance in that social capacity she will be called upon to exercise during the next four years. A bit of sentiment had caused her to wear for this function the gown in which she was married, and no fair and blushing bride ever looked handsomer or prouder than Mrs. Yates as she received the congratulations of the immense throng that passed before her. With her occupancy of the governor's official residency all classes are pleased. The masses are pleased with her democratic spirit and unostentatious bearing, the great number of club women are pleased that one of their number should have risen to distinction, and the aristocrats represented by the Daughters of the American Revolution are proud to see the representative of the nation's blue blood occupying a station befitting its purity.

ODDS AND ENDS.

OUR RAILROADS AND SOME THINGS THEY HAVE DONE FOR THE COUNTRY.

BY C. B. PARKER.

With a certain class of would-be politicians or guardians of the better interests of the dear people, such pessimistic cries as "the cruel monopoly of the railroads, extortionate charges of fare and traffic, railroad legislation, or favoritism of the corporations by Congress and State legislatures, carrying or passing friends free and charging their foes and the masses fare," are often heard. Now there may be much of truth in these charges, and the writer is inclined to believe there is, for railroads are born and operated by men, and human nature being much the same everywhere, we have selfishness as well as generosity to contend with, and we believe that one blessed with a happier optimistic spirit can see in the railroads of our country the greatest boon given to man, and not alone in the development of the country, but of manhood, morals, the schools, churches, and all that makes life worth the living.

A FEW OBSERVATIONS AND PERSONAL REMINESENCES.

During the winter of 1844–45 it was our fortune (or otherwise) to make the journey from Geneseo, N. Y., to the then far west delphi, Indiana, via Erie, Cleveland, Toledo and Fort Wayne. These were the good old days of prehistoric railroads. Our modus was a team and wagon; time required, 30 days, suffering and discomfort non-computable. Then our parents found very cheap land there worth $3 and $5 to $10 per acre. Years later the railroads came, and twenty-five years ago those lands were worth $50 to $100 per acre.

Later, during the '60's, it was the writer's mission to make the journey from Omaha, Neb., to Portland, Ore.; again in advance of railroads this required six months time, and not an acre of the land passed over was considered worth the taking as a free gift from government, and the roaming bands of wild Indians were chasing the countless millions of no wilder buffalo to the delight of the miserable coyote, that flourished on the slain or crippled buffalo, as would the politician crying railroad monopoly off the corporations, could he.

Later the railroads followed our pioneer wagon trail, and now the tourist or emigrant can make the trip in palace cars in three days, for $30, and see fine towns and cities all along the way, and as fine farms as are in Ohio, Illinois, or New York, and worth $30 to $100 per acre. And Nebraska forty years ago only a "howling desert" territory, is to-day the leading State of the Union, as to railroads, schools and churches, and ranks as No. 1 in lowest percentage of illiteracy of any State in the Union.

While it is true the Northern Pacific Co. first broke Nebraska's virgin soil for railroad purposes, to the B. & M. or extension of the C. B. & Q. must be given the credit as the great industrial as well as moral reform promoter of the great West. If asked how as to moral reform, we answer, in building and causing to be built more towns, schools and churches than all other causes; by giving employment to more brainy young men and developing them into financial and industrial giants. Along this line the railroads have done

more, and have a greater number of able men than all other industries, including the profession of law, as to enforced morality. All employees are required to abstain from the curse of drunkenness, including moderate drinking.

As to favoritism and passes for friends, it is one of many ways of showing gratitude to friends, and we are frank to confess we like the plan. For several years we never were refused a favor asked along this line; during the past ten years we have traveled many thousand miles and paid full fare for every mile, not asking favors in an instance. hence this is not offered as recompense for past favors, nor are we to any extent mixed in politics or railroad "favoritism," but only that justice may be meeted where so justly due. And if it be true that hundreds of avericious minds have extorted millions unjustly from the masses, it is equally true that hundreds of thousands of better inclined men have come up from a job at $1.25 a day on the section to $3,000 or $10,000 a year with comfortable homes and happy families; and the way is open to any sober, industrious young man to "go up" just as fast as he is worthy of promotion; and for every politician that rides on a free pass may you all worthy philanthropists, preachers, lecturers and reformers be favored as well as the poor and afflicted.

Stand up for the railroads.

LIVELY RACE IS WON.

Because Her Majesty, the Queen of England, had urgent need of divers important documents of state contained in 256 sacks of mail from far-away New Zealand, seventeen men emptied a loaded express car in seventeen minutes at the Grand Central station to-day, and then skilled drivers drove three teams headlong through the city streets to catch the steamship Campania, scheduled to sail for Liverpool at 11 o'clock

The fast special mail that brings letters and packages from the uttermost parts of the Occident to New York and the rest of the effete East was ten minutes late, and that meant a record-breaking trip to the big Cunarder lying at pier 51, North River.

Uncle Sam's dash through the city was successful, for the mail caught the steamship just before the lines were cast off, and Queen Victoria's prime minister will get his letters in good time.

The race against time began in SanFrancisco the day before Christmas, when the 256 sacks of mail, 15 of which were from New Zealand, the rest coming from Austrailia, arrived at the Golden Gate. The mail steamship left Melbourne on Nov. 30, touched at Sydney on Dec. 1, Auckland five days later and Honolulu on Dec. 17.

Long before its arrival word was carried about that the mail contained documents from the New Zealand government that should reach London by Jan. 5. It was a long race across an ocean and a continent, and Uncle Sam's officials determined to do their best to rush the mails through.

Messages were flashed across the country, and the steamship line, working in connection with Superintendent Maze of the foreign mail service, arranged for the delivery of the bags aboard the Campania. A tug was made ready to carry the mail from the foot of Fortieth street if necessary, but it was rushed aboard the train that was to speed it east. Across the plains and mountains it flew in a special express car, which was piled to the roof with the heavily laden sacks.

Across the Mississippi and into Chicago the train flew, and then the car was shifted to another train that carried it through Cleveland to Buffalo and thence to Albany. The special mail over the New York Central whirled it down from Albany to New York without a stop.

At the Grand Central annex stood a force of men under Chief Mail Clerk Edward Herr waiting for the bags. Station

Agent Downer and Foreman E. N. Edell of the Grand Central station had everything clear at this end. Three mammoth wire-screened vans stood in Depew place, each with a pair of horses that had a record of thirteen minutes from the Grand Central station to the Christopher street ferry.

The special mail puffed on track ten minutes late. Its time of arrival is 10 o'clock. Uncle Sam's representatives sprang at the sealed mail car, and the doors flew open.

Then it rained mail sacks for seventeen minutes. The car was shifted into the canal along the side of the baggage rooms, and the sacks were flung first on the baggage room floor, and thence into the mail wagons backed up to the doors on the other side.

Amid a bedlam of shouts, yells of officials checking off each sack as it was flung in, and a running to and fro of other men giving special directions for the route to the steamship, the mail was loaded up.

Across Forty-second street to Eighth avenue the wagons flew down Eighth avenue to Fifteenth street, across Fifteenth street to Tenth avenue, and thence to Twelfth street, bringing up at the Cunard pier as the crew of the Campania were preparing for the final order to cast off.

The queen's mail came from New Zealand in a ship that was making her maiden voyage over the South Sea route, the Sonoma. Built by the Cramps, she flies the American flag, and she is called "the flyer of the Pacific." In its career around the world the mail covered some 18,000 miles.

TAKING AN INVENTORY.

All successfull Business men annual invoice their stock; they are not simply satisfied with a bank account which shows that they are growing in financial strength; ut the stock on hand is gone over that just what is on hand may be known and also what its present value, whether it has advanced or depreciated, whethe certain classes of stock are ready or slow sale and all like considerations that the yearly inventory reveals to the thorough going business man.

The farmer usually knows how many head of horses, cattle, sheep and pigs are on the farm and can closely estimate the bushels of wheat oats or corn and the quantity of timber but these are not the most valuable facts that an invoice on the farm should disclose. But rather, how many acres have been required to sustain a given number of cows sheep or pigs. What are the yields per acre, what the profitableness of cerfain kinds of grain, what the farm knowledge gained from the experiment patch, what has a well systematized corp rotation done for the farm, what has the flock of hens done towards lessening the cash outlay for household expenses, what has the garden paid, what has been the actual amount paid in cash or trade for fam ily expenses, what expenses have been incurred for farm machinery and repairs, are there unncessary fences on the farm, what disposition has been made of manure, and like questions should be answered as the season's harvest reveals the contents of storehouse and barn.

When the merchant has completed his inventory he immediately prepares for the new stock and its sale, thou3h he may give the impression of doing little; if he is to enlarge his business he is at work; so the farmer known by his thrift and fine farm is known, when harvesting his crop, planning by the light of his own experiences and by gaining knowledge from those of other farmers preparing for the crops of another season. The history of excessive yield always reveals that the soil was studied, the seed carefuliy selected and the most intelligent cultivation gtven. If the inventory the farmer makes shows where mistakes have been made as well as cuccesses scored it is accomplishing its pnrpose.—Colman's Rural World.

WITH OUR EXCHANGES.

M'CLURE.

The March issue of McClure's Magazine contains a character study of Edward VII. written by George W. Smalley. Theodore Roosevelt, Vice President, contributes an article in which he describes clearly the personalities of some who have labored with success in New York City for "Reform Through Social Work." An article by Ida M. Tarbell is entitled "The Disbanding of the Union Army." Among the other contents this month are, "What We Know About Mars," by Edward S. Holden; "Billy's Tearless Woe," written and illustrated by Frederic Remington; "The Law of Life," by Jack London; "Dan McCarthy," by J. Lincoln Steffens, and other short stories including an installment of "Kim," by Rudyard Kipling.

THE FORUM.

The March number of the Forum contains an article on "British Rule in the Dominion of Canada," by Sir John G. Bourinot. "What of the Democratic Party," "The Growing Powers of the President" by Mr. Henry Litchfield West, "Labor Conditions in Switzerland," by Walter B. Scaife. Felix Volkhovsky, once a Siberian exile, has an article on "The Hopes and Fears of Russia," "The Nations in Competition at the Close of the Century," by Jacob Schoenhof, "The Career of King Edward VII.," by Mr. J. Castell Hopkins. Other articles are: " The Superintendent from the Primary Teacher's Point of View," by Alice Irwin Thompson; "Tabloid Jourualism': Its causes and Effects," by Mr. Maurice Low; "Homicide and the Italians," by Napoleone Colajanni; " The Boer War; A Study in Comparative Prediction," by Mr. Herbert W. Horwill, and "The Machiavelli of Chinese Diplomacy," by Robert E. Lewis.

THE LADIES' HOME JOURNAL.

"The only American Girl Who Ever Married a King," "The Loveliest of All Kentucky Girls," "The Anecdotal Side of Theodore Roosevelt," and "The Author's Reading at Bixby Centre," by Kate Douglas Wiggin, will have a wide reading in the March Ladies' Home Journal. And "The Gibson Play," too. Edward Bok's editorials and Helen Watterson Moody's "Girls Who 'Go In' for Something" are helpful in counsel, and will be profitably read. "The Story of a Young Man" is completed in the March Journal, and "The Successors of Mary the First" presents new and extremely funny complications and vexations. "A Successful Country House at Bryn Mawr," "A Suburban House for $6500"; a page picture showing "The Old Stage and the Turnpike," of W. L. Taylor's "The Last Hundred Years in New England" series, and "Through Picturesque America"—two pages of photographs of views in Cuba and Porto Rico. A featnre of the March Journal is Eugene Field's "Armenian Lullaby," set to music.

SCRIBNER'S.

In Scribners' for March Richard Harding Davis leads the number with an account of a journey "Along the East Coast of Africa." Thomas F. Millard contributes to this number a concluding article on "The Settlement in China." Henry Norman's Russian article in this number is of unusual timeliness in that it deals with the personality and the achievements of the greatest administration in Russia, the famous Minister of Finance, M. de Witt. Allied to all these articles which show the

political changes is an illuminating paper on "The Transfomation of the May (1825-1900)," by Joseph Sohn. One of the strongest factors in our own development is written of by Arthur Henry, who has studied the immigrants as they land in this country. In fictiou there is another Raffles story by Hornung.

A few months ago a story in this magazine entitled "The Green Pigs" called attention to a new humorous writer. This issue contains another story by the same author, Mr. Sydney Herman Preston. It is entitled "Our Two Uncles," and is a laughable farce- Frederick Palmer writes a story turning on army life in the Philippines. Bradner Matthews contributes an essay on "The English Language in America," and Alexandre Sandier, art director at the Sevres manufactory near Paris, writes of its work as applied to architectural decoration.

THE IRRIGATION AGE.

VOL. XV. CHICAGO, APRIL, 1901. NO. 7

No Market in China. The state department has made public one of the last reports of Consul Wildman of Hong Kong, who is credited with having sent Aguinaldo to Admiral Dewey in the Philippines and who with his family was lost aboard the Rio de Janerio in San Francisco harbor a short time ago. The report states that there is no market in Southern China for American agricultural machinery. Its agricultural land is divided into small holdings, many of which are not over an acre in size, and very few running over ten acres. Every available inch of this land is under cultivation and the planting and reaping is all done by hand. Where plows are used they are of home manufacture and are as primitive as those of biblical times. The majority of the peasantry, Mr. Wildman says, live at the rate of from 2 to 5 cents a day, and even if they could afford to purchase modern American farming machinery there would be no room to use it. Grain is either trod out of the straw by water buffaloes or whipped over an open tub. Even if an entire village should combine to buy an American thrashing machine it would be considered too wasteful both in the way it mangles the straw and the grain and in its expensive upkeep. In southern China there are no horses except the diminutive China pony, and, as the agricultural country is mostly flat there is no way to utilize water power. As for steam, it is an impossibility, fuel being one of the most expensive Chinese luxuries. Labor has almost no value and flesh and blood are the cheapest things on the market.

More Land in Oklahoma to Be Opened. Within a short time the tract of land known as the Kiowa, Comanche, and Apache reservations, one of the few left in the Indian Territery, will be opened to settlement. It comprises about 4,000,000 acres, lying between southwestern Oklahoma, Indian Territory proper, and Texas, and is reported to be rich and productive land. Nearly 1,000,000 acres will be apportioned to the Indians, leaving about 3,000,000 to be opened to white settlement. For those contemplating taking up land it is important to know that the rush system has been abolished. Notice of the opening will be advertised, and application must be made to the officer in charge of the reservation, who will award the lands by lot. Those drawing allotments will know where their land is located, and can make the necessary filings, while those drawing blanks will have to return home. It is estimated that the opening up of this reservation will add about 30,000 to the population of Oklahoma, giving that Territory considerably over 400,000 people—a number which has an important bearing upon the question of Statehood.

New Method of Irrigation Next season an entirely new system of irrigating orchards will be introduced in the vicinity of Ontario, Ore. It will be applied to the land that is above the canals. Water will be hauled in wagons to where it is wanted. At the root of each tree will be placed a ten-gallon water-box. This box is to be filled once every two weeks during the dry season until the tree is five years old. To fill these boxes, on the basis of twenty

acres of orchard it will require 30,000 gallons of water. This will take a team and one man six days. The soil will be cultivated thoroughly, and about three times as deep as is usual.

It is claimed by advocates of the new system that fruit raised with a dry surface will be far superior to that raised with surface watering. The spider and moth will not be attracted by damp soil. The usual water rental is $1 per acre for surface watering. It is claimed under the new system that two inches of water will irrigate twenty acres of bearing orchard. It is proposed to grow melons in the same way, the water-box at the melon-root, of course, being smaller. It is claimed that melons in this country are not of the best quality, on account of lying on moist ground and becoming the prey of the different kinds of insects. Under the new system, the melon rests on a dry surface, colors naturally, ripens evenly, is not filled with water by evaporation, has an even and regular rind, ships better, and keeps better in the market.—*Northwest Magazine.*

Rural Mail Delivery. The rural free mail delivery has come to stay, and may now be accepted as an essential feature of our vast and wonderfully reliable postal system. There is no reason why the citizen of the thickly settled farming community should not have his daily paper or his mail flung into his front yard by one f Uncle Sam's mail carriers, instead of having to quit his work to go to town and receive it at the hands of the indifferent boss of the general delivery window. In fact the government has been willing enough all along to get out into the country with free delivery mail service, but it was not believed, until recent experiments had been made, that it could do so without loss to the postal b anch.

ngrutitude Cubans. There are indications of the grossest ingratitude on the art of the Cubans toward the United States. Our country went to their relief in the hour of their dire extremety, and forced the Spanish heel off their neck. hey did little toward their own liberation. The United States did it all, and has cared for them and helped them ever since, so that they are getting on their feet, and now they show little or no gratitude toward us. At the opening of their constitutional convention they did manifest a little appreciation of our help; but now they seem loth to grant anything asked. They think they are able to get along without us, and that we ought to be glad that we were allowed to serve them. Possibly they may yet come to their senses without putting us to the necessity of forcing them to act with some sense, as well as gratitude.

Benjamin Harrison Dead. Since the day when it was announced that Benjamin Harrison was suffering from pneumonia there have been fears that he would not recover. These fears were not without cause. His rugged constitution, temperate, well-ordered life, and the skill of faithful physicians could not save him.

There have been American public men who have enjoyed popular affection in a greater degree than Benjamin Harrison. Nature did not bestow on him the peculiar qualities which won for Clay and Blaine the devotion of their followers. On the other hand, no prominent American has possessed in a higher degree than the eminent Indianian the great qualities of sincerity and integrity. They gained him the respect of the American people. With these were united mental abilities of a high order. Happy accidents may have contributed much towards making the grandfather President of the United States. Not accident but native ability and hard work lifted the grandson to that position.

The rebellion made a soldier of him for four years, and he was a good one. Nature designed him for a lawyer, and he was a great one. It was because he was so good a lawyer and held the bench in such high esteem that the judicial appointments made by him during his administration were of such uniform excellence. He tolerated no interference when making them.

As a Senator he was indefatigable and thorough in the discharge of his duties.

So was he as Presicent. He performed with dignity, conscientiousness, and courage all the duties which devolved upon him. All he did was done in strict accordance with his convictions.

At the close of his term he withdrew from the field of political activity and gave himself up to the law. The Venezuelan boundary dispute was one of the important cases in which he took part. He was counsel for the republic before the arbitration tribunal which met at Paris. He took little part in the discussion of political questions until the controversy arose as to the constitutional statis of our insular possessions. His convictions compelled him to differ from the policy of his party and he was too sincere a man to hide his views. As he was an admirable constitutional lawyer the public listened respectfully to his arguments even when it did not agree with them. The general expressions of sorrow which his death has called forth show in what high esteem he was held.

The country has lost a man who served it well in war and in peace, to whose name no scandal attached, and whose sincerity never was questioned.

Rice Culture Prof. Elmond Mead and Prof. Frank Bond, experts in the Department of Agriculture, are making a tour of Texas and Louisiana in the interest of rice culture. In an interview in the *Houston Post*, Prof. Mead said:

"About four years ago congress made an appropriation for the study of irrigation and created the position of expert in that line, adding it to the agricultural department. For three years thereafter the expert studied irrigation in the arid regions, where crops are never grown to any extent, save by the assistance of irrigation.

"Last year the department took up the investigations in the humid and sub-humid territory, and taught the farmers in Missouri, New Jersey and Wisconsin to make several blades of grass grow where none had grown before. Every place the agricultural department has assisted in this matter has been benefited.

"We have decided to see what assistance we can render the rice growers of Texas and Louisiana, and Prof. Bond is here for that purpose. He will spend most of the summer here investigating the system you have of cultivating crops of all sorts, especially rice. Prof. Bond will study the question in all its phases. The canals, the flow of water, the expense, the sort of machinery, etc., will all be thoroughly tested and a bulletin issued by the government upon that subject.

"I know of no place that needs expert service of this sort more than does this territory. It is a country of wonderful possibilities. Rice culture as carried on here is far ahead of the little portions of South Carolina which grow it There they cultivate it by hand, and from the time the seeds are sown until the cereal is reaped and threshed and bagged the most primitive methods are used. It is cut with a hand sickle and sown and hauled off with an ox, shod with raw-hide shoes—the shoes are to keep the ox from getting lost in the mud. As carried on there it is not profitable at all.

"Prof. Bond will investigate the quantity of water it requires to irrigate an acre. We find that there is a great difference of opinion on this score. Some use, for instance, six gallons a minute, while others use thirteen, and so on. This will be tested. He will measure the losses by evaporation. The bulletin which will be issued by the government will give all the results of these experiments. Also the complete rice district of the Southwest, the value of the crop, the money invested and other things relative thereto."

IRRIGATING INDIAN RESERVATION.

SPEECH BY HON. WILLIAM M. STEWART, OF NEVADA, IN THE SENATE OF THE UNITED STATES.

The policy of irrigating Indian reservations for the benefit of Indians is established. The only argument adduced against this amendment arises from the fact that it may incidentally benefit white men, and of course white men, if they live in the West, have no rights which certain persons, whom I will not name, are disposed to respect. In this same bill we find a provision for Indians:

> For construction of ditches and reservoirs, purchase and use of irrigating tools and appliances, and purchase of water rights on Indian reservations, in the discretion of the Secretary of the Interior and subject to his control, $100,000.

It seems to me, when it is so clear from the conceded facts that this reservoir ought to be built for the sole benefit of the Indians, that it is a very poor reason for objecting to it that it will also enable some white settlers to get homes. There will be more water in the reservoir than the Indians will need. This surplus water will irrigate enough government land outside the Indian reservation to return the whole cost of the reservoir. It will cost the Government nothing to restore their water to the Indians.

The only excuse they could find to delay building the reservoir for the Indians is this scheme to put a pipe in the dry bed of the stream and catch underflow. That has failed again and again. It is nothing but a temporary makeshift. Everybody who has seen those schemes tried knows that. It is a waste of time to experiment with it.

The little Indian inspector who wanted the handling of this money is the only authority quoted by the Senator from Connecticut [Mr. PLATT] against this proposed plan. They are always small when you put them at great work.

Mr. SPOONER. Unless they agree with you.

Mr. STEWART. Unless they agree with you. Of course that would magnify them very much, because it would be some evidence of good sense.

Mr. SPOONER. Strong evidence.

Mr. STEWART. This region of country where this reservoir is proposed to be built is historic ground. Before any race which we now know of inhabited that country large irrigation works were estab-

lished and cities were built. On one of my earliest trips in that region crossing from north to south, I passed several old ditches higher up than any now used. I spent some time trying to gratify my curiosity. We found the ruins of these old cities, with pottery there and every evidence of an advanced civilization. It is a remarkably fertile region with water. Without water, of course, it is a desert. Along the river there are several tribes of Indians—the Pimas, Papagoes, and Maricopas—who carried on their industries. They were a good people. They were irrigators and farmers before the white people went into the country. They remained friendly to the people of the United States during all the Indian wars.

Their villages were a refuge for the pioneers of that Territory when a white man's life was hardly safe anywhere else in the Territory from the murderous Apaches. Now we are taking care of the Apaches. They are fat and sleek. But the friendly Indians must starve because they could not protect themselves. They are the wards of the Government. If they had been white men they would have gone into court and prevented the diversion of their water. But the Government did not protect them, and now their water is gone and we are told we can not build this reservoir because we might, in addition to doing justice to the Indians, reclaim some desert Government land and provide a few homes for white men.

These Indians were never dependent on the Government until their water was taken from them. They are not roving Indians; they are farmers. They cultivated their little farms and made a living for themselves, and they will do it again if we give them back their water. If we do not, they must starve or be fed, and to feed them makes beggars and mendicants of them. But some people would seem to prefer that Indians should starve or beg or be made paupers, if necessary, to prevent the Government getting back the cost of the reservoir from settlers on Government land. What is their wrong about the Government getting its money back? What is there wrong about irrigating some desert land so white settlers can cultivate it? Will a few more white men's homes do any harm?

The Government report (Storage of Water on Gila River, Arizona, by Lippincott, House Document No. 351, Fifty-sixth Congress, first session) tells all about these Indians and the way they have been neglected. Here is what it says on page 9:

> The Gila River Indian reservation is occupied chiefly by the Pima and Maricopa Indians and a limited number of Papagoes. The first knowledge we have of these Indians is obtained from a narrative of Cabeza de Vaca, a Spanish explorer, who visited this region about the year 1536, after an adventurous journey overland from Florida. This traveler describes them very much as they are to-day. They occupied the same lands as at present, and have evidently long been industrious and successful farmers and irrigators, as they continued to be for many years after the acquisi-

tion of Arizona by the United States. Their average wheat crop was about 2,000,000 pounds a year, besides which corn, pumpkins, beans, sorghum, and vegetables were raised in large quantities. They manufactured ollas, or earthen jars, and baskets, and wove very fine blankets and cotton fabrics. They lived in small villages and held their lands in severalty.

The Pimas have always been friends of the whites and enemies of the Apaches. They gave succor and assistance to the early white settlers, and their doors were always open to peaceable whites or Indians when hard pressed by the savage foe. It is their boast that their hands were never stained by the white man's blood. It was under such conditions that they were joined, about a century ago, by the Maricopas, who came as fugitives from the more powerful Yuma tribe. When the belligerent Apaches gave trouble to the settlers, the United States troops sometimes obtained substantial aid and comfort from the Pimas in the way of subsistence.

The agriculture of the Pima Indians was carried on entirely by irrigation with water diverted from Gila river. These tribes have always supported themselves, and their progress toward civilization has been regarded as one of the encouraging features of the Indian problem. During the last ten years, their irrigating water having been taken away from them, they have lapsed into indolence, want and vice.

Their condition of prosperity, industry, and independence continued until by the settlement of the Gila valley above the reservation the water supply was partly cut off and began to be deficient for the cultivated lands on the reservation.

On March 27, 1895, Mr. J. Roe Young, United States Indian agent at Sacaton, made a terse statement of the case to the Indian Bureau, closing his letter with the following recommendation:

"What is best to be done I do not know. I recommend, however, that a competent, thorough and skillful engineer, well acquainted with irrigation questions, be employed to ascertain and report, first, whether or not under existing conditions a supply of water adequate to the needs of these Indians can be obtained and retained permanently, and then, if such a supply can be obtained, what is the best, most feasible, practicable, and economical method of doing so.

"To properly do this the engineer should examine carefully the past and present condition and flow of the Gila river, the amount of water which formerly passed through this reservation, and the amount we are now receiving; the number and amount of inches of water for which charters for ditches have been granted in the different counties through which the Gila flows, and the amount of water taken out under these charters, together with the number of such charters now legally in force; the underground currents and rock strata along the river, and all matters which taken together may lead to some solution of this question. I have been unable to get an estimate of what amount such an investigation and report will cost, but I would suggest that the sum of $5,000 be set apart from any appropriation available for this purpose. Competent and first-class engineers, with ability to make such a report as this case requires, are scarce and high priced, and they have to be well paid. It would be money thrown away to employ a man not thoroughly posted.

"This matter should be taken up soon, in order that we may know what to expect for next year."

Mr. Elwood Hadley, who is now (1899) the Indian agent at Sacaton, in describing the present condition of the Indians of the Gila River reservation, writes as follows, under date of September 25, 1899:

"Approximately 6,000 Indians—Pimas, Papagoes, and Maricopas—are dependent for their subsistence upon the lands of the Gila River reservation, which reservation contains 357,120 acres. It is estimated that half of the land could be made productive with water to irrigate it. The water supply in the Gila river the present season, owing to its use for lands above us, has not been sufficient to irrigate 1,000 acres. Fully half the crops planted have not produced enough for seed. This land is very fertile. The condition of affairs here shows that in the past three years there has been a large falling off in the water supply for irrigation. The reason is apparent in the absorption of the water by additional cultivated lands above.

"I notice in the Indians a restlessness as they realize their helpless condition,

and am often confronted with the solicitous queries, What are we to do? If we plant what we have, what assurance have we of getting it back? Under favorable conditions these Indians, being agricultural and pastoral, would soon become independent, prosperous, civilixed citizens. Otherwise, discouragement, hunger, and destitution are their lot. A nomadic life being taken on, their old tribal nature asserts itself, and the expenditures hitherto made and being made by the Government for their education and improvement prove a curse to them rather than a blessing.

"It is now necessary to issue considerable subsistence to the Indians whose crops have been a failure, and this aid will have to be largely increased under the existing limited water supply. A supply of water would permit of the Pima boarding school establishing a model farm, greatly reducing the cost of maintaining the school of 200 pupils, and be a most valuable educational factor in the school life of the pupils. The available Indian labor in the construction of the reservoir is an important factor, as it is much better to provide them labor with pay than keep them as paupers. These Indians are willing to work and their moral status is good. Their attitude toward the United States has always been friendly. They have saved the Government in protecting the early settlers from the ravages of the Apaches. They have kept themselves within the bounds of law and order, and they are now left upon the desert without water. Humanity speaks, economical administration for the sustenance of the Indians speaks, and nature in her wise provisions says: 'Let man's means and intelligence be made operative, that these Indians, whose claims are meritorious, be reinstated in self-sustenance and lifted to the plane of prosperous American citizens."

Again (page 17):

In order to determine the amount of water that will be required for the Indians on the Gila River Indian Reservation, Mr. Elwood Hadley, United States Indian agent at Sacaton, was requested to make a statement on the subject. In his reply, dated October 12, 1899, he writes:

"It is estimated that there are nearly 4,500 Pima and Maricopa Indians on the reservation dependent for their subsistence upon its lands. South of this reservation, in the country lying between the Southern Pacific railroad and the border line of Mexico, it is estimated that there are nearly 2,000 nomadic Papagos, who derive much of their subsistence from the Pimas of this reservation (Gila River) in exchange for their labor. The Pimas are liberal and kind to their more unfortunate brothers, and give them a share of their products in return for their labor in harvesting the crops.

"The estimated number of Indians under my care is as follows: Pimas, 4,200; Maricopas, 350; Papagos, 2,700; total, 7,250.

"The number named above who live on reservations away from here would gladly come here if they could be furnished with water. It is estimated that 2 acres of land will sustain an Indian."

There has been an investigation of this matter. All the matters that the Senator from Connecticut complained of have been investigated. I read again from this report:

In November 1895, the Secretary of the Interior instructed the Director of the Geological Survey to detail a civil engineer to make the examination recommended, and Mr. Arthur P. Davis, hydrographer, was accordingly assigned to this task, in which he was assisted by Mr. Cyrus C. Babb, assistant hydrographer, and Mr. J. B. Lippincott, resident hydrographer for California. Six months of time and $3,500 were expended in the field on the preliminary investigation, and a report was submitted in 1896, entitled The Report on Irrigation Investigation for the Benefit of the Pima and Other Indians on the the Gila River Indian Reservation, Arizona.

We find in the appropriation act of two years ago the following provision:

For ascertaining the depth of the bedrock at a place on the Gila river in Gila county, Arizona, known as The Buttes, and particularly described in Senate Document No. 27, Fifty-fourth Congress, second session, and for ascertaining the feasibility and estimating in detal the cost of the construction of a dam across the river at that point for purpose of irrigating the Sacaton Reservation, and for ascertaining the average daily flow of water in the river at that point, $20,000, or so much thereof as may be necessary, the same to be expended by the Director of the United States Geological Survey, under the direction of the Secretaay of the Interior: *Provided*, Th at nothing herein shall be construed as in any way committing the United States to the construction of said dam. And said Director shall also ascertain and report upon the feasibility and cost of the Queen Creek project mentioned in said Senate document.

Under this appropriation a preliminary investigation has been made, and the following summary is given to show that the Government can get its money all back from the land (p. 94):

Total water supply to be delivered to the point of diversion from San Carlos reservoir for irrigation each year.....acre-feet....	241,396
Estimate requirement for Indians.....	40,000
Remainder available for irrigation of public domain or private lands .....acre-feet....	201,396
Assume a duty of water of 2 acre-feet or 24 inches in depth used each year on each irrigated acre; this would permit the irrigation of lands outside the reservation to the extent of.....acres....	100,698
There are 289,211 acres of arid public land in the district to be supplied from this system. Assume that the water is given to the Indians without cost to the Government and that these 100,698 acres must pay the total cost of the works, then the necessary charge per acre for the remaining water rights to be sold would be.....	$10.24
It is believed that the public lands with this water right could at this rate, be sold within a year.	
If 3,000 Indians have to be fed by the Government at a cost per ration per day of 10 cents, the annual expenses would be	$109,500
The capitalization of $109,500, at 4 per cent, would represent the practical permanent expense of feeding these tribes This is equivalent to a permanent Government debt, which would be liquidated by this construction, of.....	$2,737,500
The value of the 100,698 acres of irrigated public lands that would be taxable would be $50 per acre, or a total of.....	$5,034,900
The saving, without expense to the Government, by irrigation of 20,000 acres of lands belonging to the Indians, has been shown to be.....	2,737,500
Total increase in value without public expense.....	$7,772,400
There will also be a large increase in value of taxable town property not estimated upon.	

The report that came in is very elaborate. They examined all the modes of supplying the reservation with water. It is presented here [exhibiting] with plats, and with a full detail of surveys, and they come to the conclusion that this is the only feasible and practical way of irrigating it. They have to a great extent estimated the cost. They spent the $20,000 in making this examination. The amount was entirely inadequate to complete the examination.

This provision simply proposes to complete the investigation and

the surveys for the purpose of ascertaining the cost, and, in order that the United States may be protected, the amendment proposes to withdraw from settlement a large tract, which is practically desert land, but which would be pounced upon by all sorts of schemes if there was an idea that it was to be irrigated. It will probably irrigate one hundred or a hundred and fifty thousand acres of land, capable of supporting fifty or a hundred thousand people. It is a great enterprise. The ditch necessarily goes through it, and before the ditch is located it is necessary to withdraw the land, so that the Government can hereafter dispose of it.

This commits the Government to nothing that it is not already committed to. It directs the prosecution of the investigation, and in order to complete the investigation and at the same time protect the United States it is necessary to have a survey showing where the ditch will be and what land will be irrigated. So the amendment proposes to withdraw the land until the survey is made and until all the estimates are in.

You cannot make a complete contour survey with a little money. It takes considerable money. A hundred thousand dollars will be required to survey this, and then you will have the proposition before Congress. It is simply carrying out the policy of Congress already settled upon. It involves nothing further than having the facts of this great enterprise fairly brought before Congress. Then, that being done, if it is thought that the policy of irrigating by the Government shall not be adopted, Congress can provide for the sale of this enterprise to private parties, the land will be reserved, and there will be something for the Government to sell.

Mr. BEVERIDGE. May I ask the Senator from Nevada a question?

Mr. STEWART. Certainly.

MR. BEVERIDGE. I understood the remarks of the Senator from Connecticut to be directed to this point, and I think they were very pertinent: Why should the investigation be confined to this particular method of irrigation? Why should it not permit any method of irrigation that may be wise to be investigated?

Mr. STEWART. There is a pamphlet here showing why. They have already gone on. There is no other method.

Mr. BEVERIDGE. The Senator from Connecticut says the other methods have not been exhausted.

Mr. STEWART. He thinks they have not. I think they have.

Mr. PLATT of Connecticut. Will the Senator permit me? Why is the clause which was contained in the original authority to investigate left out of this provision? It provided that nothing in it should commit the Government to this enterprise.

Mr. BEVERIDGE. If I understand——

Mr. THURSTON. Mr. President——

Mr. STEWART. One at a time.

Mr. THURSTON. That suggestion was not made in committee this year, and I see no reason why there would be an objection to adding it.

Mr. BEVERIDGE. Then that would meet the point made by the Senator from Connecticut. I was about to ask the Senator from Nevada whether it is true that all other methods of irrigation have been tried and have been cast aside as inadequate?

Mr. STEWART. You will get some water, some underflow, but there were men before the committee who said that the underflow is now down 3 or 4 or 5 feet deeper than it was a few years ago. You cannot get a permanent supply in that way.

Mr. BEVERIDGE. I understand that the Senator from Nevada says he will accept that amendment.

Mr. STEWART. I want to say something, if you will let me have the floor for a while.

The policy is established that we should irrigate for the Indians. We give them vast tracts of land, and we may spend three or four hundred thousand dollars a year irrigating for them, and we have it conducted under inexperienced men, Indian inspectors or something of that kind; yet if by any possibility the irrigation benefits the white man, then it becomes a monster. That is the extraordinary feature of the opposition to this measure. They say you can not irrigate to help the Indians if by any chance there may be some irrigation for white men too. Agriculture has been conducted more by irrigation than by rainfull in this world. All ancient agriculture was by irrigation.

Mr. BEVERIDGE. No.

Mr. STEWART. Pretty nearly all was by irrigation. Only recently have they undertaken to subdue countries where there was rainfall. See the great irrigation works in Africa and in Western Asia. All those great civilizations were by means of irrigation. Two-fifths of the entire area of the United States requires irrigation. It is a vast empire where you can make homes for 50,000,000 people, if irrigated, and it will not be nearly so thickly populated then as were ancient countries. You see ruins of the irrigation plants of the ancients; they are being excavated now, and other people are taking an interest in it. In Egypt they are excavating old irrigation works, which show that the Sahara Desert, or a large part of it, was once irrigated, to the wonder of the world. There is masonry there that cannot be surpassed to-day. It is being developed everywhere.

Here we have a country of immense possibility, and because this improvement may be used for the benefit of white people there is objection to it. If it could not be used for white people, if it could not benefit white people, there would be no objection to it. There is no

objection to irrigating for the Indians. But here, according to the report, the Indians cannot be successfully supplied without at the same time providing more water than they need and benefiting white people. The Senator says: How can you build this reservoir without injuring the Florence Canal Company? The canal company took it from the Indians, but the settlers under the canal bought their land of the Government. It will be hard to take the water away from them and give it back to the Indians now. That would ruin the white settlers. Nobody proposes to do that.

But by building this reservoir the Government can provide new supplies for the Indians, so as not to injure the white settlers under the canal. Justice can be done to all parties, no one will be injured, and the Government can get all its money back. But that seems to be what they object to—that and the possibility that some of the desert might be irrigated to make homes for some more white men.

Mr. SPOONER. The whole subject of irrigation is a very large one. We have a Committee on Irrigation, have we not?

Mr. STEWART. Yes.

Mr. SPOONER. Is the Senator from Nevada chairman of it?

Mr. STEWART. No.

Mr. SPOONER. He was at one time.

Mr. STEWART. Yes.

Mr. SPOONER. Now, if the Government is to be committed to the scheme of irrigation—it may be a good thing—why is not a bill brought in here, an independent proposition, which can be debated?

Mr. STEWART. Because the Senate is not sufficiently educated.

Mr. SPOONER. That is the way to educate it. Why is it always done on some provision in an appropriation bill?

Mr. STEWART. So that we can talk about it and discuss it.

Mr. SPOONER. All you want, then, is talk?

Mr. STEWART. No; I want you educated. I want to accomplish something. If I can educate you and get you to understand it, you will be the most enthusiastic friend of irrigation in the Senate.

Mr. SPOONER. Very likely; but every attempt to inaugurate this system has been by stealth.

Mr. STEWART. It is not done by stealth.

Mr. SPOONER. We discussed one proposition at the last session of Congress which was under the guise of improvement of navigation.

MR. STEWART. Let me tell you something——

Mr. SPOONER. It was perfectly obvious——

Mr. STEWART. Let me tell you something perfectly new to you, that you do not know.

Mr. SPOONER. I will not say that I do not until I know what you are going to say.

Mr. STEWART. You will hear it right now. We are spending $10,000,000 in the river and harbor bill to improve the navigation of the Mississippi river, when we all know that that is not the purpose. It is to protect the lands there. We know that is the purpose. A great many things are done by indirection. I should not be surprised if my friend the Senator from Wisconsin has done some cunning things by indirection. He does not always tell what he is after. I am willing to say that I should like to see this experiment tried, because it is the only way of supplying the Indians, and in addition it may illustrate a great principle. There should be no objection to it.

Mr. SPOONER. As a lawyer I have not always informed my antagonist what I was about, but as a legislator I have endeavored to be frank and not to seek in legislation to accomplish anything by indirection.

Mr. STEWART. I am not seeking to accomplish anything by indi rection.

Mr. SPOONER. Every time this irrigation proposition comes before the Senate, instead of coming at an early day in the session and in the form of some well-defined plan, reported by the Committee on Irrigation, so that we can consider it and be educated by the Senator——

Mr. STEWART. It would take a long time to educate you. We could not get a hearing.

Mr. SPOONER. It would take a long time, perhaps, to be educated by the Senator from Nevada.

Mr. STEWART. Yes.

Mr. SPOONER. But it always comes under cover.

Mr. STEWART. Who is making this speech?

Mr. SPOONER. If you do not want me to interrupt you, I will not. But it always comes under cover.

Mr. STEWART. No; it does not come under cover. It does not always come in that way. Here is a proposition in this bill for irrigating Indian land. It has gone through every time, but there is objection to this because it may incidentally irrigate other lands. It is a proposition where you can not irrigate the Indian lands without irrigating other lands, and because you cannot do it, are you going to let the Indians starve? There are over 5,000 Indians there. There is no way of getting a permanent supply of water unless you build the reservoir, which will provide more water than the Indians need, which can be used for irrigating some other Government land. Therefore, rather than benefit the white man, you will not have a survey and you will not have an investigation.

Nobody is going to undertake this enterprise unless the land can be reserved. If the lands are not withdrawn before the survey is made there will be obstructions in the way. Nobody will do it, private

parties will not do it, the Government will not do it unless it can have the benefit of the irrigation when it comes. This bill provides for that.

I desire to say to the Senator from Connecticut and the Senator from Wisconsin that Eastern people are not so universally against the improvement of this vast region as you might suppose in the first instance. Nearly the entire press of the country advocates the reclamation of these arid lands.

A more direct way of improving the Mississippi would be to make lakes in the mountains, and you would not require so large an annual appropriation for the Mississippi. I have no doubt that great results can be accomplished by storing the water to mitigate the floods but the objection is raised that it will benefit lands in western Kansas and Nebraska, and probably western Arkansas—in fact, all through the West and on the Missouri river and its tributaries. That, they say, must not be done. You must let all the floods come down if by stopping them you would reclaim the arid lands. They say that must not be done. Better to have the floods, they say, than to reclaim any of the deserts—and so the floods keep on coming.

You do not make objection, and I do not make objection, to building up the banks to protect the people from overflows. I believe it ought to be done, and if that is the only way in which those States can be protected I am in favor of doing it. But if you are going to protect them by building up banks, why not do it also by building the reservoirs. You may say it is doing it by indirection, but you put the appropriations in the river and harbor bill to build up the banks, and I am in favor of doing it, not because it is necessary for the improvement of navigation, but because it is necessary to protect those great States from overflows. That is why it is done. And if the appropriation to build the banks goes in the river and harbor bill, there is no reason why the appropriation for the reservoir should not go there too.

Now, here is a case where you can not successfully irrigate the lands for the Indians—we have had the investigation and we have reports on it—without this great reservoir and canal. Nobody will undertake that work unless the land is withdrawn. You can not make any progress toward it unless you have a survey and the withdrawal of the land. You have to make a contour survey and withdraw the lands, and then undoubtedly you can find many persons and many corporations, if you are willing to let it be monopolized when you have surveyed it, to take it off the hands of the Government. It ought not to be monopolized. The Government ought to do it. But that country ought not to be always a desert. It is the grandest enterprise I know of to reclaim a very large amount of land which, when it is re-

claimed, is worth from thirty to fifty dollars an acre. It is marvelously productive; you will build up a prosperous community there; and these incidental benefits that come from it should not be an objection to the building of that reservoir.

The tronble I have found is the general fear that legislation might be enacted which in some way would develop the West. You make Indian reservations without paying any attention to the white people, and you exclude the latter from them. You protect barbarism; you do anything but give the whites a fair show. You must admit this ought to be done for the benefit of the Indians; and it is absurd to say that it must not be done because it might also benefit the whites.

There is no reason why this experiment should not be conducted to its consummation. Let us know what can be done. This water may be taken out on either side of the river. There is a vast region on each side of the river that may be irrigated. As soon as you determine where it shall be, unless you withdraw the land, there will be scrip and all sorts of obstructions in your way. So in connection with this investigation we have the land withdrawn; and that is all there is new in the proposition. It is merely carrying on further the former investigation which was ordered. We have the preliminary report of it. It is just finishing up this investigation, and it is provided that there shall be a sufficient survey to enable the Department to determine what lands will be irrigated, and then if it must be done—if you will not let the Government do it—you can turn it over to private parties.

It will be a square proposition, after the investigation is made, whether the Government will do the work, notwithstanding the fact that it does benefit white people. That will be the question then. That question does not arise now. We are committed to the policy of making this investigation, and why should it not be completed? The other modes for supplying it have been exhausted. We went down there with an appropriation of $20,000 last year to feed the Indians because their lands could not be irrigated. If their land could have been irrigated by the water that can be reservoired there, they would not have neeeded to be fed.

Mr. TELLER. The appropriation was $30,000.

Mr. STEWART. We appropriated $30,000 to feed the Indians because their lands could not be irrigated. The Indians would have accomplished it themselves if they could have done it. They got along all right before their water was taken away from them. They are industrious and intelligent Indians, and there is no trouble about that. They would have done all this themselves if it had been practicable. The fact that it was not done and we appropriated $30,000 to feed them shows that it could not be done. They can build the ditches to carry

the water to their farms, but they cannot build this reservoir themselves. If it was being built they could do much of the work on it and earn wages to keep them until the reservoir is completed. Then they would have the water again.

Now, it is said the reservoirs will fill up. There are various modern methods of keeping reservoirs clean. Land in India has been irrigated for thousands of years and reservoirs have been filled up, but they have methods of cleaning them, methods of sluicing them out. I believe we can keep these reservoirs entirely clean. The report from Mr. Schuyler (Senate Document 152, Fifty-sixth Congress, first session) says they can, and he investigated that very proposition for the Government. We can not reclaim any of our desert lands unless we keep the water flowing. Of course there must be an aqueduct at the lower part of it to let the water out. That water can be sluiced off, so as to go down and keep it clean' That is the modern theory. The idea that we can not maintain a reservoir is a proposition against any irrigation.

This is the most magnificent place in the United States for an experiment. Let us know the facts before any large amount of money is spent. It will require only $100,000 to make the necessary surveys and secure the dam site. When that is done, the Government is not committed at all. If they find that because it benefits the whites it ought not to be done, it will be time enough to stop them. But to stop before an investigation is made, on the theory that it might benefit somebody besides the Indians, although it may be the only method by which the Indians can be supplied, and I think it is, is absurd. You have got to feed these Indians or irrigate their land. It may be that you will think when the survey is made that it will be better to feed them. That may be the result, but before you make the determination that it is better to feed them than to have the work done, you had better hesitate, particularly since you have undertaken it.

You have got a partial report, and to make the report available for any purpose it will require an appropriation of another hundred thousand dollars. The appropriation of $20,000 went as far as it could, but they could not make for that amount any survey that would be complete enough for practical purposes. You have ascertained the facts for $20,000, and they have done a great work, more than is usually done for that amount of money. They have exhibited the facts, and they have come to the conclusion, as they say here, that this is the only method to irrigate the Indian reservation. Let us know the extent of it, what it will amount to. Then we will determine what shall be done.

I have no doubt if you should give the land which could be irrigated to a private corporation the work would be done. There is no

doubt about that. There may not be many parallel cases to this, but in this case the land that will be irrigated will pay for the expense of the reservoir and the ditch many times over, because it is exceedingly valuable. You will hardly find another place such as that in the world. Let us have the facts about it and then let the Government advertise for bids to do it if the Government does not want to do it itself. I would not be in favor of doing that. I think the Government ought to do it. But it ought to be done in some way, because here is a place for from 50,000 to 100,000 people if the land is irrigated.

The people of the West have good cause to complain when the people of the East object to ordinary appropriations for the Indian service because it may benefit the whites. Senators talk about this being an entering wedge. I am not in favor of any entering wedge, but I am in favor of investigating and determining whether we can not stop the flow that goes down the Mississippi and keep the water up there and irrigate the West. I am in favor of some experiments. This would be an object lesson worth trying. Great Britain has spent in India over a hundred million dollars in irrigation works, and has continuously spent it, to help develop that country.

These are great enterprises, and they demand a very large expenditure. The debt of India consists in irrigation works and railroads to develop that country, and they have made it very productive. If it had not been for the irrigation works the famine there would have been universal. Famine comes there on account of drought.

The West will in time be teeming with population. It is bound to come. Two-fifths of the area of the United States is not going to remain a barren waste when everybody knows that it can be reclaimed and be made the most productive land in the world. One acre of irrigated land will produce as much as four acres of any other land. You can go into any State of the Union you please, and on land properly irrigated you can raise a maximum crop every year, and generally two or three crops with the water that comes down and fertilizes it.

This is a great proposition, and it would not be doubted at all if it had not been condemned as an evil purpose, and the charge made that somebody wanted to swindle the Government; that somebody wanted to rob the Government. When I see $80,000,000 in a river and harbor bill to benefit every little creek and harbor all over the country, and when I see $10,000,000 of that going to protect the farmers in the Mississippi Valley, which ought to be done, I do not think it is a crime to suggest that some of these waters might be kept in reservoirs above, and thus relieve that river and spread the ferrility over a vast region, which will be more fertile than any other we have. Irrigated land is the best land: The time will come when there will be a teeming population in those mountains. It may come slowly, but I do not

think it ought to be condemned as a crime, and the people of the East do not think so either. I will ask also to insert in my remarks comments and papers on the subject of irrigation from every section of the country.

[The editorial extracts on the national irrigation policy have already been published in THE AGE.]

I should like to have Senators read those views and see to what extent the country is being educated. Fault is found because an association of people are in favor of this great enterprise, and we have objections about irrigation associations. There are a great many associations. There are mercantile associations, and there are associations in favor of the improvement of rivers and harbors. I remember when I was a boy there were meetings held in favor of internal improvements, and they were addressed by orators from all parts of the country.

It was an issue whether there should be any internal improvements at all or not. That policy has been established, and see what it has done for commerce. There was the organization of associations everywhere to promote internal improvements which we now have as a settled policy, and it should be no crime now to advocate the improvement of this vast section, two-fifths of the whole area, which is known to be fertile. That should be agitated. It should be discussed in the newspapers, as the question of internal improvements was thirty, forty, or fifty years ago. It is not a matter of reproach. It is legitimate American enterprise; it is legitimate American thought, and it ought to be heeded.

I have not introduced bills to make special appropriations for dams, reservoirs, etc., because the country was not prepared for it. It takes time for the country to wake up to it. The first bills that were introduced to improve rivers and harbors were beaten in Congress. But the necessity for it grew as commerce grew, and the necessity for utilizing this vast heritage of two-fifths of the whole area of the United States for the coming population will grow stronger and stronger. Whatever may be said, something will be done, and it will be honorably done. There is no indirection about this proposition. This proposition comes straight to investigate a matter where it is necessary for the Indians, and in that investigation and in those surveys there may be an incidental benefit to the whites if it is carried out.

I am certain that it will be carried out. It will nearly double the population of Arizona. It will be a great object lesson. If the Government is not disposed to carry it out somebody will. If the lands can be used and protected and the opportunity is given, why should we

be accused of indirection and trickery and all that because we are in favor of giving proper attention to a great subject? The greatest subject now agitating the minds of the people, so far as this country is concerned, is whether we can irrigate that vast region and populate it as thickly as Indiana and Illinois. Although we will always have waste lands there, there are valleys you can populate much more thickly than those States. More people can live on the same area of irrigated land than can live where you depend on a rainfall. You can have the thickest kind of population where you have irrigation.

The people all over the country, not in the arid region alone, are looking to this as a heritage of America where American enterprise is to go, and from which great results are to come. To accuse men of bad faith, and all that because they are in favor of what is for the manifest interests of the country is something which I reject and repel. There has been nothing done in connection with this question which should reflect upon anybody as honorable men. This proposition was commenced two years ago. It has progressed thus far. The question is, Shall the investigation be completed and the proposition be put in a position where Congress can do it, or should somebody else do it?

I do not care how much talk there is about the flow and about getting the water there, you have now got to support the Indians at the rate of $30,000 a year, and if the Government went on with this enterprise it would give them all employment. They will work. They are good Indians and they have been accustomed to work. There will be no trouble about that. They go off to find work. I know them well. They are Indians who have always had "a local habitation and a name" where they live; and if you give these Indians an opportunity to work they will do so; and if you give them back the water for their farms they will cultivate them and make a living for themselves. If you feed them you make paupers of them. You have no right to do that. They were never beggars. They always took care of themselves, and we must give them that same chance again. It would be a great wrong to make beggars of them. Let them work and earn their own living from their little farms. That is what they want.

If Congress will not authorize the Government to do it, let us give the contract to other parties to build this dith, and make it a condition that these Indians shall be employed. But that question is to be determined when the result of this investigation comes in. I do not think that the investigation should be stopped for the bare fear that it might illustrate the possibilities of developing that country and benefiting mankind, and showing what vast resources we have. Because the possibilities are good that may come from the investigation I do not think should be stopped.

Nothing is asked from the Government of the United States ex-

cept money for the investigation, and the question as to whether the Government shall undertake the work of building the dam is entirely open and remains so. I would not ask the Government to build the dam without having it perfectly understood why it was done. The reason should be always given. Everything should be frank, as it is in this proposition. I say now that I shall never argue that the Government is committed to this proposition because this is done, but if it illustrates a great idea, shows the road to wealth, to prosperity, to progress, to the place to make homes for people, nobody will be sorry; and the Senator from Connecticut will be delighted, because he is a good man at heart. He is full of prejudice, but he is not as bad a man as he tried to make us believe he was. He does not hate the West.

I believe all these people who are opposing it are pretty good, but they have been living in a certain locality and they get in ruts. They have not seen that country. Let them go there. I should like to hear what they would say then. A handful of Mormons went into the desert, and it looked as if living there was impossible. The history of the opening of the country at Salt Lake is the most interesting part of the history of the United States. They learned to irrigate the land and they have made it a rich State, a garden spot, and they have set an example which has done good everywhere. When, without money, poor as they were, foot-sore and hungry as they traveled over the plains, they could stop there and build up such a country as that, it shows what can be accomplished. When you see them in their homes now it makes you glad that the pioneers, if they were Mormons, did such great work.

It was because they were Mormons that they had a faith which held them together, and they accomplished great results and built a great results and built a great State. Now, when such results are shown to a person who goes there a good deal of his prejudice must melt away, and a good deal of your prejudice will melt away when you see what irrigation accomplishes. Go to Colorado and see what irrigation has accomplished there. You can see what they have accomplished in various Western States. You see beautiful fields, rich fruits, and everything produced by irrigation. Follow it up and see how much land remains unirrigated, and you see what vast opportunities are spread out to American enterprise. When you see all that you will commence studying how we can devise some legislation that will facilitate this great work.

It is proposed now that we shall take some money out of the Treasury and irrigate the lands for the Indians, and this investigation is to determine how much money may be needed and whether it will all come back to the Treasury from the Government land which will be irrigated with the surplus water in excess of which the Indians

need. There are over 5,000 Indians who have got to be provided for. Either they must be fed or they must have the means of irrigation. The amendment provides for completing this investigation. The last investigation, which was carried as far as the money went, gives maps of the dams and everything that could be done with that money, but now it is found necessary before it can be accomplished to have more money to complete the investigation and test the foundation for the dam, and I believe we should have more money. I do not believe Congress will quit this investigation until the investigation is completed.

BILL WILLIAMS FORK DAM.

ONE OF THE MOST STUPENDOUS WORKS OF THE NEW CENTURY.

In this mining district of Arizona, mention is seldom made of the great agricultural possibilities of the fertile arid plains and semi-tropic valleys of Arizona. Much of this land goes under the general mishomer of "desert," and at certain seasons of the year its parched appearance gives color to the justice of the name; but, as a matter of fact, the sun shines on no more fertile land, and all that is needed to make that land a wilderness of flowers and foliage is water. With water, there is absolutely no element or chance about the wonderful productiveness of this soil. All Arizona knows this, for each and all of them have crossed parched wastes one week and returned the next, after a rain, to see the same lands a waving mass of green and growing foliage, refreshing to the air and beautiful to the sight. The rapidity of such growth is something marvelous.

With water, that verdure becomes permanent; without it, its duration is short lived. Where such land has been brought under irrigation, prosperous communities have been established, and towns and even cities have sprung into being, while the bounteous products of that soil have brought a reign of comfort and plenty where before desolation prevailed and the demon of isolation reigned.

These remarks were prompted through the accidental obtaining of the information that one of the most stupendous irrigation, mining and electric power generating projects ever put on foot in America is about to materialize in this section or country, under the ownership and management of a syndicate of eastern moneyed men, the corporation being known as the Plomosa Water & Power Company, of which company Wells H. Bates is president. Mr. Bates has worked for years to bring this grand enterprise into existence, and no one is better posted than he on the wonder which plenty of water will work in this land of mineral and agricultural wealth, where water—and only water—is the needed open sesame to all that man most desires here below.

Having gotten the eastern end of the project well under way, Mr. Bates came west some weeks ago, and left Prescot a few days ago for the Bill Williams Fork of the Colorado. Prof. Church, a civil and mining engineer of world wide reputation, is now en route from New York city, and will join Mr. Bates on the Bill Williams Fork, where

the party will thoroughly explore the country, taking about six weeks time to do it, after which a most exhaustive report may be looked for, including more details as to the great undertaking which is no less than a water storage dam to impound the waters of the Bill Williams Fork for purposes of irrigation and the generating of electric power for use in the rich mining region of which the dam will be the center, and also to supply light and power for the to be populous centers of the fertile citrus belt of valley country below.

As the Courier understands it, this dam will be located at a point in northeastern Yuma county, close to the southern line of Mohaye and the western line of Yavapai, while the agricultural land and great beds and bars of auriferous gravel lie in Yuma county. The whole section between Bill Williams Fork and Tyson's Wells is said to be gold bearing.

Before the last storms commenced, and after one of the most continuous and depressing drouths ever experienced in Arizono, Bill Williams Fork contained a flowing sheet of water 100 feet wide and six inches deep.

The dam will be 125 feet high and will create a lake eight miles long and two miles wide, storing 21.000,000,000 cubic feet of water—more storage capacity than is possessed by all the combined water storage dams of the state of California. For three miles below this dam the maine irrigation pipe conveying the water to the valleys below will be suspended high in mid air, spiked to and along the sides of the perpendicular walls of stone peculiar to the massive natural scenery of that weird and wonderful section of country. Directly below and tributary to this water so piped lies 500.000 acres of fertile land situated in one of the mildest and most even climates in America, and wherever touches this land all growths valued in the semi-tropic zone will spring up almost spontaneous. Here, the man with the hoe need not be bowed down or miserable, for nature herself has provided so many of the elements of success that little labor will be needed to perfect the plan. The valleys to be irrigated are Cullens valley, Desert valley, and Piomosa valley. There are also tributary to this dam almost limitless beds of gold-bearing gravel, the gold taken from which is coarse and high grade.

The company now owns 10.240 acres of this gold-bearing gravel, and there is 30,000 acres of what is known as the desert placers. The existence of great veins of copper and gold bearing quartz has long been known of in this section which, owing to its isolation, is as yet almost a virgin field, so far as mining is concerned. The water power will be used to work great dynamos, which will supply electric power to all that section, which will, beyond any question, in the not distant future support a population of not less than 20,000 people, and

arrangements are even now taking shape for the colonization of this modern Eden with thrifty people who will take hold of the wonderful advantages there offered and make homes for themselves and bend their energies to the increase of the necessaries of life for all mankind and make the before waste places the beauty spots of the earth.—*Prescott*, (Ariz.) *Courier*.

THE DIVERSIFIED FARM.

In diversified farming by irrigation lies the salvation of agriculture.

PROFITS IN PEARS.

Pears are generally neglected in planting a commercial orchard, and one of the most profitable fruits forgotten. Those who have had years of experience in growing the pear find it pays handsomely if properly handled. The pear orchard requires about the same soil as that demanded by the apple. The trees thrive in all apple growing latitudes and may be grown on any good orchard land. A sloping, well drained hillside with a clayey formation is best suited to pear growth. If the climatic and protected conditions are favorable the trees may be profitably grown in river or creek bottoms where there is plenty of humus. It is necessary that a quick, healthy growth be obtained in order to get early bearing and prevent the ravages of parasites and fungus diseases.

Both the quantity and quality of pears are greatly influenced by plant food. Pears are heavy consumers of potash and respond well to liberal applications. It is necessary, though, to see that a sufficiency of phosphoric acid and nitrogen are applied. If a complete fertilizer is used, it should contain say 9 per cent each of phosphoric acid and potash and about 3 per cent of nitrogen, and can be used at the rate of about 800 lbs. per acre annually.

Another economical plan for fertilizing the pear orchard is to grow clover or peas to furnish the nitrogen, and in turn fertilize these with phosphoric acid and potash; about 200 to 250 lbs. of muriate of potash and 300 to 400 lbs. of acid phosphate per acre can be broad-casted and worked into the soil before the peas or clover are sown. This produces a heavy growth of the legume, which in turn will keep the soil well supplied with nitrogen and organic matter.

There are many varieties of pears both the dwarf and standard. The Wilder is one of the most popular early kinds, having many strong friends among the orchardists. The Bartlett is probably the most popular of any and is one of the best bearers. Among others generally planted are the Flemish Beauty, Clapp's Favorite, Seckel, Lawrence and Winter Nellis. By planting the different varieties there is a more perfect blossom fertilization and the fruits continue ripening from midsummer until late in the fall. Trees may be had from any responsible nurseryman in any of the fruit-growing centers. It is well to get those grown near home and thereby have them acclimated. They range in price from five cents to twenty-five cents each. Small trees are generally preferred.

Pear trees may be planted as close as fifteen feet apart either way for the standard, and ten feet for the dwarf. They should be pruned in a conical form and kept free from disease. Annual spraying with a preparation of lime, sulphur, lye and salt destroys the scale and red spider. The blight is something more troublesome and harder to conquer. A thrifty growth, gained by clean cultivation and liberal manuring of the needed elements of plant food will insure the orchard against the blight and similar diseases. A pear orchard should be kept clean of noxious weeds and grasses. If not cultivated it is well to mow the weeds two or three times every summer.

The picking and marketing of pears is

equal to one-half the battle in making a success of the orchard. The fruits should be marketed a few days before ripening. If in doubt as to when they should be picked, take hold of a pear and gently raise the fruit straight up above the stem, if ripe the fruit will snap from the branch. They should all be picked in the same manner, leaving the entire stem on the fruits. In some markets pears must be wrapped separately in tissue paper, and packed in boxes weighing about forty pounds each. Other markets demand the open baskets. Winter pears may be picked in October or November and put in boxes for Christmas. They seldom sell for less than two cents a pound, and even sometimes go to double that price.

JOEL SHOMAKER.

PLUM CULTURE.

Plum culture is one of the profitable industries for general farmers and fruit growers. The trees come into good bearing in five or six years from planting and the fruits are always saleable at fair and remunerative prices. An eight year old plum tree will generally bear four or five bushels of good fruit annually. This is marketable in the fruit centers at an average of one to two cents a pound. I am familiar with several plum growers who claim that the trees bring from $3.00 to $10.00 each every year. They may be planted as close as sixteen feet apart either way, making the crop of an acre one of profit.

Any good orchard soil will produce plum trees and return most satisfactory dividends on the investment. A rich protected location is best suited for some varieties, while a creek bottom or natural wooded place is adapted to the hardy native or wild fruits. The plum is a hard wood tree that takes up much plant food. The ashes are rich in potash, which is annually consumed by the tree and fruit growth. A good fertilizer for plums would be 400 to 600 lbs. of ground bone and 200 to 250 lbs. muriate of potash per acre, applied annually, broadcasted and worked well into the soil:

There are several excellent varieties of plums, each having its own claims for superiority. In the northern and western States the Greengage, Lombard and Washington are preferred. One grower recently said his Greengage trees had brought him $10.00 each for many years, by drying the fruit and selling much the same as prunes. In the middle section of States the Wild Goose, Yellow Egg and similar American varieties are probably the most profitable. The Japan plums, among them being the Abundance, Red June and Burbank are popular and good sellers in the southern districts. Some growers say these varieties will produce fine specimens the second year after planting.

Plum trees may be obtained from any nurseryman at prices ranging about twenty cents each. The small trees are cheapest and generally give the best satisfaction. They cost less and are more liable to live and become acclimated than the older ones. Some of the native varieties, like the Pottawatamie, may be planted in clusters with fair profits assured. They fertilize their blossoms better and bear more uniform fruits when grouped in similar varieties. Some successful plum orchardists keep poultry in the groves to rid the trees of the curculio. Ordinary insect enemies may be destroyed by spraying with arsenical solutions similar to those used in the apple orchard.

The marketing of plums is an important item that growers must keep in mind. The fruits will generally stand shipping to a considerable distance. Regular boxes packing about twenty pounds are advisable for market. If not sold green the plums may be cut open with a knife and evaporated either by improved methods or drying in the sun. In either case the dried fruit sells well and brings good returns. Where

the market does not justify the handling of green plums, and dried ones are not practicable, the fruits may be canned and sold at satisfactory prices. If well handled the plum orchard is one of the most profitable. JOEL SHOEMAKER.

NUT CULTURE.

The growing of nut trees is one of the most profitable and much neglected industries. As an investment against the misfortunes of old age there is nothing that offers better and safer security than a few acres of the leading hardwood nut trees. They are ornamental and valuable for shade and windbreaks around the home, orchard or barn, and every year of growth adds to their commercial value. The ruthless destruction of native forests has necessitated a reform in the tree planting matter, and bounties are offered in some States for the man who will plant trees on his farm. The farmer who will give ten acres of land to tree culture and plant the nut-bearing varieties, will gain more annual wealth than the banker who loans money or the capitalist who carries life insurance policies for investments.

Among the many varieties of nut trees are the walnuts, hickory nuts, pecan, filberts, butternuts and chestnuts. Walnut and hickory timber is always in demand, and the prices are increasing every year, because of the timber becoming scarcer. The original investment for planting out a hardwood grove need not be very great, and in a few years the income begins. Some chestnut trees will produce $5 to $10 each year, and begin bearing within five years after planting. The filberts will yield profits within three or four years. Hickory trees will bear nuts in five to eight years after planting. In addition to the nuts that may be harvested every year, a hickory tree will always sell at from $2 to $10 to wood workers, blacksmiths and others needing such timber.

The best line of treatment for nut trees in the way of fertilizing is to make an annual application of about 800 lbs. per acre of a fertilizer analyzing 8 per cent each of phosphoric acid and potash and 2 per cent of nitrogen; the fertilizer should be broadcasted and then worked well into the soil. Instead of the above, 400 to 500 lbs. of fine ground bone, and 200 to 250 lbs. of muriate of potash could be substituted with advantage. If a systematic line of fertilization is not followed, the soil will become exhausted of its natural fertility, and the yields will fall off. It is much easier to keep up the fertility of soil than to restore it after it has once become exhausted.

The land for tree planting should be thoroughly cultivated and plowed deep before time for setting the trees. Springtime is the best for planting most nut varieties. They may be obtained from nurserymen at very low rates if purchased by the hundred or thousand. One year old trees are probably the best and cheapest. Black walnut seedlings ten inches in height may be obtained for two or three cents each, butternut for five cents, and American sweet chestnuts and shellbark hickory for the same price. If planted in groves ten feet apart either way the trees will grow straight and the timber be more valuable. At this rate 500 trees will plant an acre. Some of the finest nut groves in the United States are planted in rows standing not more than four feet apart, making about 3,000 trees on an acre.

Nuts possess certain food values that cannot be overlooked in every farmer's family. Chopped nut meats are relished for nut sandwiches, and nut salads are regarded as delicacies. Many nuts are used in the making of cakes, confectionery and creams. There are many ways in which the farmers' boys and girls can make handsome profits from the nut groves. The pleasure of owning a tract of land that grows every day into wealth is a boon to be desired by every man. There are nu-

merous hilly slopes, deserted fields, unused spots in creek bottoms and on slopes about the farm and house that can be used for this purpose. The money value of a place will be enhanced a hundred fold in a short time by the systematic planting of nut trees, whose profits may be counted as certain as the seasons come and go.

JOEL SHOMAKER.

BUILDING UP A DAIRY HERD.

A good dairy herd cannot as a rule be bought. It must be built up by the owner through careful breeding, selecting and feeding. Excellent dairy heards can be ruined about as quickly as anything else in this world. In the hands of a man who does not understand the animals, and who fails to appreciate their good points, the herd will degenerate so that within two years their value is lower by one-half than at first. On the other hand, many an otherwise apparently poor herd can be brought up to a high point of efficiency through the skill and sympathy of a good breeder, feeder and selecter. There are latent points in most herds which require the appreciative eye of an expert to detect and bring out. I have time and again found in what looked like scrub cows most excellent breeding and dairy qualities, but these had been so overcome and lost by general neglect that the animals appeared to be nearly worthless. I make it a point to examine the individual cows of different herds for sale, and in this way I am often enabled to make selections that are worth considerable to me, but nothing practically to the owner. The lack of appreciation in some owners is shown by the way they will praise the qualities of some particular animal in the herd, which for some reason appeals to them with considerable force, but which in reality possesses far less actual merit than some unworthy looking scrub. Now it is the height of skill to be able to go through a herd of scrubs and common barnyard cows and pick out here and there animals that possess unusual qualities. Yet every herd, no matter how poor apparently in material, has one or more such animals. If the dairyman understands his business let him go around the country and pick up his material. He must first understand his business thoroughly and not be misled by appearances. If he can make his selections with unerring skill he is bound to find the work profitable. Such cows only require the right sort of feeding, care and breeding with good bulls to make their progeny excellent dairy cows. Building up the dairy herd in this way is both profitable and interesting. One feels that he is getting something for nothing, or rather that he is receiving pay for his skill and knowledge in judging animals.—*A. B. Barrett in Minnesota American Cultivator.*

THE FARMER'S WORKSHOP.

Every well equipped farm should have a shop which can be warmed, where much repairing of farm implements, harness, etc., may be done. The man handy with tools will be able to make many conveniences for the household if a place is provided where such things may be done at "odd moments," when outdoor work is not admissible. Such conveniences greatly facilitate the work both in the house and at the barn, and are not provided because there is no suitable place in which to make them or leave them in the partially-finished stages. To purchase them outright is often not to be thought of on account of limited means.

The workshop will enable one to put all implements in readinesa for use, and the time to prepare for war is in time of peace. The tools needed for farm repairing will be better cared for if a place is provided for them and for using them. Then, too, in such workshop the boys may be taught lessons of thrift, economy and industry, and it gives them an opportunity to expend their activities on stormy days. This fea-

ture of farm life will receive greater emphasis during the new century, for learning properly to use tools is being urged in the newer education, and our manual training schools will give us boys that not only know Greek and Latin and numerous "ologies," but will also know how to properly use tools. The tool chest and the workshop will then be a necessity. The training of hand and brain is the only true education, and many of our agricultural colleges are emphasizing this fact and giving an opportunity for such instruction in manual training as will render the boys skillful in the use of tools.—*Coleman Rural World.*

NEW METHOD OF PURIFYING MILK.

Professor James Snow of Penn Yan, N. Y., aided by Z. C. Keeney of Chicago, has discovered and perfected a process for making cow's milk absolutely pure, free from tuberculosis, and so perfect in condition when delivered to the consumer that it is richer and healthier than when taken first from the bovine. This is the claim made, and practical tests are to be made at an early date at Springfield, Wis., where a rectifying plant is to be erected and milk destined for Chicago treated before being delivered to the city consumers. Professor Snow is the discoverer of the process by which unfermented grape juice is produced, and Mr. Keeney has devised with him the mechanisms for the purification or rectifying of milk. Springfield, Wis., has been selected for the first test house location because of its being the center of a great milk shipping district.

Dr. Adolph Gehrmann has analyzed a sample of rectified milk and made this report upon it:

"The microscopical examination of the sample of milk No. 7,020 has shown the presence of micrococci, bacilli and sarcinae and an absence of bacillus tuberculosis."

Thomas Toby of the Santa Fe road's eating house and dining car system was also given a sample for practical test. He reported:

"While manager of the Creamery Rest I handled rectified milk successfully. I gave it a nine days' test in an ice box and at the end of that time found it as sweet as the first day it was received from the dairy. The test was under most unfavorable circumstances, there being two severe thunderstorms during the nine days."

Professor Snow began working on the rectifying process in 1894, and about 1898 became satisfied that a new and perfect way of purifying milk had been discovered. Practical tests of his discovery were made here, the machinery needed was constructed here, and H. T. West, who has the promotion of the company which is to treat the milk hereafter, began his work. In treating cow's milk fresh from the animal the rectifying process does not condense it, does not take anything from it but disease germs, and adds nothing to it but greater health-preserving properties. This Professor Snow unqualifiedly claims. He says:

"I have worked on the theory that all milk first taken from the average cow is impure, necessarily must be so, and that these impurities could be removed."

He claims no more for rectified milk than that when served to the consumer it is of the same grade and quality as though it came from an absolutely healthy cow of the finest breeding, fed with the purest food and kept under extraordinarily good conditions.

The average dairy cow is not so kept, and all milk coming from it needs treatment, in the opinion of Professor Snow. The most to be feared from cow's milk is tuberculosis and the disease germs which come from unclean stables, unclean farm hands, impure drinking water and impure foods. After being taken from the cow the milk is handled in a sloppy manner, hauled in dirty wagons to dirty stations, and brought to the city in dirty cars. Milk so handled

cannot be treated with antiseptics, because forbidden by the law, and antiseptics are dangerous to the health. Professor Snow is strenuously against their use in any manner. He also opposes the process of "preserving milk," in which embalming fluids are used. His aim is to take out of milk, by a simple and natural process, all germs that will cause typhoid fever, diphtheria, dysentery and the other sicknesses so often traced to impure lacteal fluid.

His process of "rectifying" is a secret. But the milk is first put through a treatment with heat and then a treatment with acid. Then the milk is cleansed, so that all impurities are taken from it and it is ready for the market. No large plant is required for the work. The milk is not sterilized, because that destroys its value for butter making. It is delivered to the market fit for any purpose. It can be whipped into any form of ice cream, and will not sour from electrical disturbances nor thunder storms, will not churn into fatty globules when on the cars and in motion, and is disease free. The mechanisms invented by Mr. Keeney will rectify and make ready for the market from 100 to 1,200 gallons of the milk in from thirty-five to fifty minutes. A plant costing $15,000 to erect will handle 25,000 pounds, or 300 eight-gallon cans of milk per day. Chicago's daily receipts of milk are about 25,000 eight-gallon cans.

A can of the rectified milk was shipped 200 miles by rail, moved from one depot to another and passed through a thunderstorm in hot weather. At the end of three days it was still fresh and sweet. The cream from rectified milk can be used with all of the higher grade of flavors in making ice cream, such as the vanilla bean and the like. Rectified cream is odorless. Diseased butter cannot be made from rectified milk, nor diseased cheese. Mr. Keeney says of it:

"No extraordinary claims are made for the milk, except that when it leaves our process, which is simple, it does not contain a single germ injurious to the human body. For commercial purposes it gives a cream hitherto unknown to manufacturers. It nullifies the bad stable, bad cow food, bad handling. It makes it possible to give weak and ailing children pure milk at all times. It puts on the table sweet, wholesome and fresh milk from which no strength-giving property has been taken That is all there is to rectified milk and all we claim for it. The discovery is one of the most important of the age and we purpose to give Chicago the first benefit of it. Professor Snow is a chemist of high standing, and his success with unfermented grape juice indicates what he must have discovered in the direction of milk. We hope to begin operations at Springfield at a very early date, and to eventually purify all the milk brought into Chicago."

PULSE OF IRRIGATION.

A PRIVATE IRRIGATION SYSTEM.

It has recently been reported that Mme. Modjeska contemplates selling her beautiful country place in Orange county and returning to her native land. A first-classs ierigation system has lately been constructed on this propsrty. A writer in the Santa Ana Blade says:

"This system is worthy of more than passing mention, as its completion is a work of greater magnitude than has been before attempted by any private individual in Southern California, although storage dams have been constructed at various points by corporations. In brief, the system here referred to is intended to utilize the waters of an overflowing mountain stream, and for that purpose a concrete dam has been built at a point near the mouth of a canon. through which the stream finds its way, and at the precise spot where the almost perpendicular walls converge so as to leave but a comparatively narrow opening, but form a basin above capable of holding millions of gallons of water. The walls of the canon at this point are of solid rock, and in deep niches cut for the purpose, the ends of the dam are firmly anchored on either side. A technical description of the structure and the system of which it forms a part is as follows:

"The dam rests on solid rock, an excavation of eight feet in depth having been made for the purpose. As it is the design of the owners to eventually carry it to a height of forty feet above the ground surface, the foundation was made twenty-five feet thick, calculated to be sufficiently heavy to stand the strain of forty feet of water, or 350,000,000 feet.

"As an additional safeguard it is built in a curvilinear form, with a radius of 100 feet, which adds materially to its strength.

The present height of the dam is twenty-eight feet above the bed rock, or twenty feet above the surface of the ground, the profile showing a thickness of four feet at the top. The length at its present height is seventy feet. A scouring-gallery, $2\frac{1}{2}$x4 feet is provided near the bottom, closed by an iron gate. The plan is to keep this gate open during the winter storms, permitting the flood water to pass through, thus preventing the reservoir from filling with sediment washed down the canon from the mountain sides. This gate will be closed in the early spring in sufficient time to fill the reservoir with clear water.

"The dam was built entirely of concrete and stone; 350 barrels of cement and 500 cubic yards of sand, gravel and rock being used in its construction. It had a severe test during the recent storm, the reservoir filling and the water flowing two feet deep over its entire crest.

"A ten-inch iron pipe was laid through the dam for the purpose of drawing off water for irrigation purposes, and a three-inch pipe is provided for carrying domestic water to the residence, half a mile distant. Water for irrigation purposes is to be conducted from the reservoir through a ten-inch cement pipe, made on the ground from material at hand, and flumes laid along the mountain side. This plan is adopted in preference to open ditches to avoid waste of water by seepage and evaporation.

The successful completion of this undertaking, it may be remarked in passing, will doubtless be but the beginning of

many such enterprises, for in the mountains east of Santa Ana are many such canons, the waters of which may be impoun ed in like manner for use in irrigating the adjoining mesa lands. Among these may be mentioned Trabuco, San Juan and Silverado, besides many others of lesser importance, but in all of which sufficient water might be secured to add many times to the value of adiacent lands, the probable cost of such an undertaking." —*California Minor.*

WATER FOR CORONA.

The stockholders of the Corona Irrigation Company met Tuesday for the purpose of electing officers and otherwise perfecting their organization. T. P. Drinkwater, president; T. C. Jameson, vice-president; L. R. Curtis, secretary, and M. Terpening, treasurer. The board of directors, previously elected, consists of the following named gentlemen: Daniel Lord, L. R. Curtis, T. P. Drinkwater, T. C. Jameson and George W. VanKirk.

This completes the work of organization, and hereafter all the proposed development work for the purpose of securing an increased supply of irrigating water for Corona will be conducted by the new company. It will make all purchases of lands, construct canals, pipe lines, etc. The company is now in a position to prosecute the contemplated work with vigor, and it is the purpose to push matters as fast as possible.

Work on the water-bearing lands in the Perris valley is already progressing under the supervision of A. F. Call and John Megginson, and the indications thus far are all for the best. It is stated that the wells already completed will yield an average of 150 inches each by pumping. The water is found at a depth of seventy feet and it rises to within twenty feet of the surface, making pumping comparatively easy, not requiring heavy machinery. The boring of additional wells will continue until enough water has been developed to secure the company in any possible emergency.

Contractors are going over the territory with a view to making bids for the construction of the necessary pipe and canal line to convey the water from the wells to the head of the present pipe line in the Temescal valley. The new line will be twenty-nine and one quarter miles in length, and will be principally open cement ditch, pipe being used only where absolutely necessary in crossing canyons and traversing steep hillsides, and along certain county roads. The capacity of the proposed canal will be 800 inches, and the system complete will cost about $150,000, exclusive of water-bearing lands.

The right of way is now secure, the company having been granted permission Wednesday by the supervisors to run the line along certain public roads in the Third and Fourth districts, and few obstacles remain to overcome. The work of construction, when begun, will be required to be completed inside of three months.—*Corona* (Cal.) *Courier.*

ARROWHEAD RESERVOIR.

The Arrowhead Company has been spending more energy and money of late on the reservoir project in Little Bear valley than ever before.

Work on the tunnels is being prosecuted as rapidly as possible, and now work on the great dam is about to begin. It has been stated by officials of the company that over 300,000 worth of cement has been purchased, and that the thousands of barrels will be conveyed to Little Bear valley at an expense of almost $50,000. They will soon attempt to sink a dam down to bedrock. It is expected that when the tunnels and dam are completed and the water let in the valley, pressure of 10,000 horsepower will be obtained. This is far greater than the combined pressures of all the other reservoirs in the San Bernardino mountains.—*San Bernardino Times-Index.*

ODDS AND ENDS.

WHERE THEY KEEP HOGS PENNED.

He climbed into the trolley car and sat down at the outer end of an empty seat. A few blocks farther on a stout woman with a basket full of stuff tried to get on. He helped her put the basket under the seat, and sat along to the middle, letting her have the end place.

Passengers on the other seats bent curious glances upon him.

At the next stop a young woman with a baby wanted to get in. The other seats were full. At the risk of life, limb and baby, she swung herself up the step by one hand, squeezed past the market-woman's portly form, knocking off the hats from the row of people in the seat ahead, and was about to worm her way past the first named passenger, when he surprised her by sliding along. She gave him a mistrustful "Thank you."

"What was wrong with me back there, to make everybody stare and whisper so?"

The conductor was a mannerly man.

"Oh, nuthin' much," he said. "But I guess you're from the country all right, ain't you?"

"Yes," said the stranger; "from away back in the country; never rode on cars like these before."

'I thought not," said the conductor. Never mind, you'll know better another time. I'll just give you a pointer. When you get into an open car, always sit at the first end. Keep the outside seat. It isn't quite so comfortable as it is to move along, but it's town manners. Make everybody else climb over you—big and little, old women and babies—everybody. They're used to it. But never on any account move along to accommodate anybody in a street-car."

"I think," said the stranger softly as he hastened off to his train, "that I'll stay on the old farm. We have plenty of hogs there, but we keep 'em penned and don't have to associate with them." And the conductor scratched his head and grinned. —*Northwest Magazine.*

THE PLACE I ONCE CALLED HOME.

As the low and lingering shadows steal
softly to the night,
I tread with silent footsteps toward a welcome parlor light;
A light that seems far brighter than the
stars in heaven's dome,
The light that lights the parlor of the
place I once called home.
I long to swing the portal that's been
closed to me for years;
Lo, the window's dim and frosty; no, no, it
is my tears!
For I see, in loving silence, the family sitting there,
And mother knitting absently beside an
empty chair.

In a gentle retrospection, I chase the tears
away,
And lure to fading memory that sunny
summer day
When I started out, light-hearted, with
blessings and advice,
To those distant fields of fortune, with fate
to cast the dice.
I remember I was picturing myself, as off
I went,
Well—that somehow I was destined to be
the president,

And how mother rudely shattered that castle in the air,
As she sobbed, "Whatever happens, I'll keep your empty chair."

A score of years have flitted to the limbos of the past:
I stand with courage vanished, where all wand'rers stand at last,
At the threshold of the homestead, there, with a long-drawn sigh,
Praying for a word of counsel on the way that sinners die;
Pleading just for food and shelter, and a mother's loving kiss,
And a father's grip of friendship, for a hope that's gone amiss—
Pleading from a heart that's welling in a breast o'erfilled with strife,
For love to shed its lustre on the shadow of a life.

Shall I enter? Can I enter?—with failure in my pack,
And vainly try to turn the hands of life's old timepiece back,
To the happy days of childhood, to boyhood's magic spell
With the linnets in the orchard, watching windfalls as they fell;
With little brother Willie, riding every day to school
Down the daisy-dotted meadow, astride our lop-eared mule;
With all the other children romping in our wildtime play,
With the little bed to go to when daylight stole away?

I know they'd gladly greet me, if I'd only just walk in,
And surprise them with my presence. Alas, I can't begin
To muster up the grit I had, for all my courage went
With the vision of the future when I'd be president,
But O, mother! mother!! mother!!! do come and ope the door,
Hold out your arms to take me to the happy days of yore,
Help lay aside the burden of my trouble and my pain
That my bent and sunken shoulders can never bear again!

When the sun marks noon of lifetime, when once the morning's done,
And from dawn we turn reluctant to face the setting sun,
We grow more worldly, somehow, for our hearts turn callous-like,
And don't seem much to notice, then, the stumps along the pike;
And, once the journey's started, might as well trudge on ahead—
So I'll keep ever moving and not bring to life the dead,
Nor the hopes that peaceful slumber, nor break the mystic air
Of the memories bright that linger around the empty chair.

—*Robert Mackay in Success.*

THE MAN BEHIND THE BAR.

The man behind the gun may have a nerve that's No. 1,
He may rush, without a tremor, on the foe,
But the danger he must face is only as the merest fun
Compared with other terrors here below.
When the women get their hatchets and set out
To scatter costly glassware all about—
When the wrought-up Mrs. Nations madly go to jam and jar—
When they hammer down the windows and the doors,
When they spill the firewater on the floors,
It is worse than common warfare for the man behind the bar,
And he's lucky to escape without a scar

It may be a thrilling moment for the man behind the gun

When the decks are cleared for action, out at sea,
But it's forty times more thrilling when a dozen women run
Through the streets, dead set on letting liquor free—
When they hold their spattered skirts up and begin
To cut the hoops and knock the stoppers in—
When they open up the cases where the fancy juices are—
When they fiercely rush to tear the faucets loose—
When they render the free lunch unfit for use—
Then there's always something doing for the man behind the bar
If he hasn't wisely sprinted fast and far.

O, the birds are sipping whisky from the cow tracks all around,
See the streams of seltzer spurting here and there!
Behold the cloves and coffee that are spilled out on the ground—
Yonder goes a leather dice-box through the air!
There are new demands for hatchets every day;
Newer faces are appearing in the fray,
And there's terror in the places where the drink dispensers are,
For the sounds of falling mirrors swiftly spread—
The men who lift the schooners drink in dread,
And from Kansas to Chicago folks are going forth to mar
The features of the man behind the bar!

—*Fresno Republican.*

THE BAD BOY.

His hair is red an' tangled, and he has a turned-up nose;
His voice is loud and strident, and it never gets repose;
His face is full of freckles, and his ears are shaped like fins,
And a large front tooth is missing, as you'll notice when he grins,
He is like a comic picture from his toes up to his head—
But his mother calls him "darling" when she tucks him into bed.

It is he who marks the carpet with the print of muddy boots;
And rejoices in a door-bell that is pulled out by the roots.
Who whistles on his fingers till he almost splits your ear,
And shocks the various callers with slang he chanced to hear.
He fills the house with tumult and the neighborhood with dread—
But his mother calls him "darling" when she tucks him into bed.

—*Washington Evening Star.*

KIPLING'S LATEST POEM.

[Mrs. Beerbohm Tree is nightly reciting this poem at the Palace Music Hall in London, receiving $500 a week for her services and contributing this to the soldiers' fund. One Thursday night recently her plea, "Pay, Pay, Pay," met with such a warm response that she was almost driven from the stage by the hail of silver thrown by the enthusiastic audience.]

When you've shouted "Rule Britannia," when you've sung "God Save the Queen,
When you've finished killing Kruger with your mouth,
Will you kindly drop a shilling in my little tambourine
For a gentleman in khaki ordered South.
He's an absent-minded beggar and his weaknesses are great,
But we and Paul must take him as we find him;
He is out on active service wiping something off a slate,
And he's left a lot o' little things behind him.

Duke's son—cook's son—son of a hundred kings,
(Fifty thousand horse and foot go ing to Table Bay),
Each of 'em doing his oountry's work (and who's to look after their things?)
Pass the hat for your credit's sake—and pay—pay—pay!

There are girls he married secret, asking no permission to—
For he knew he wouldn't get it if he did;
There is gas and coal and vittles and the house rent falling due,
And its more than rather likely there's a kid.'
There are girls he walked with casual; they'll be sorry now he's gone,
For an absent minded beggar they will find him;
But it ain't the time for sermons with the winter coming on—
We must help the girl that Tommy left behind him.

Cook's son—Duke's son—son of a belted Earl,
Son of a Lambeth publican—it's all the same today;
Each of 'em doing his country's work (and who's to look after the girl?)
Pass the hat for your credit's sake, and pay—pay—pay!

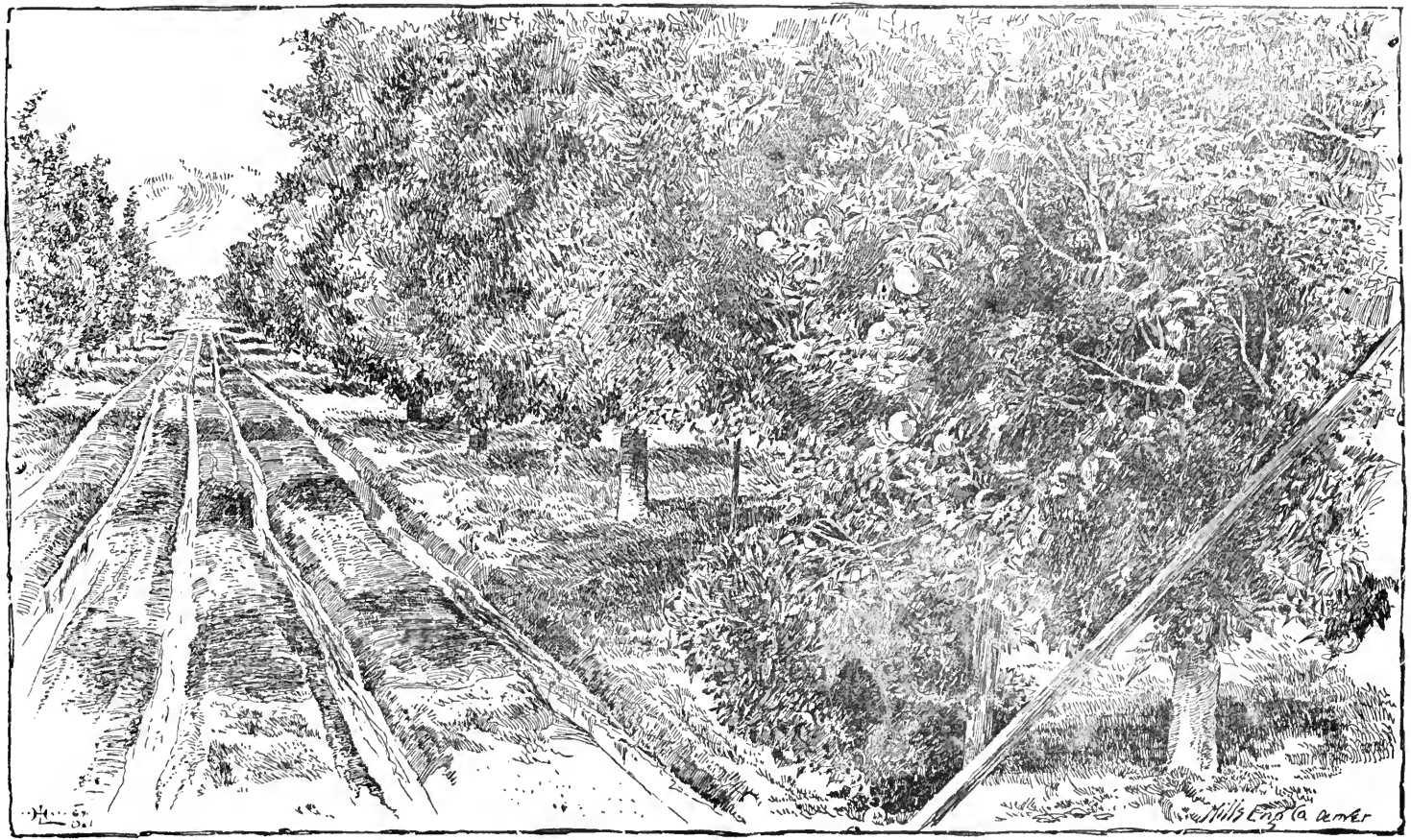
There are families by thousands far too proud to beg or speak,
And they'll put their sticks and bedding up the spout,
And they'll live on half o' nothing paid 'em punctual once a week,
'Cause the man earned the wages is ordered out.

He's an absent minded beggar, but he heard his country's call,
And his regiment didn't need to send to find him.
He chucked his job and joined in—so the job before us all
Is to help the home that Tommy's left behind him.

Duke's job—cook's job—gardener, baronet, groom—
Mews' of palace or paper-shop—there's some one gone away,
Each of 'em doing his country's work (and who's to look after room?)
Pass the hat for your credit's sake and—pay—pay- pay.

Let us manage so as later we can look him in the face
And tell him—what he'd very much prefer—
That while he saved the empire his employer saved his place,
And his mates (that you and me) looked out for her.
He's an absent minded beggar, and he may forget it all;
But we do not want his kiddies to remind him
That we sent him to the workhouse while their daddy hammered Paul.
So we'll help the home that Tommy's left behind him.

Cook's home—home of a millionaire—
(Fifty thousand horse and foot going to Table Bay),
Each of 'em doing his country's work—(and what have you to spare?)
Pass the hat for your credit's sake and pay—pay—pay!



THE IRRIGATION AGE.

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The President and Irrigation. The transition from barron alkali wastes to scenes of rich vegetation and luxurient growth, the result of irrigation, must have impressed the president and his party with not only the great productivity of irrigated land, but with the significance of the word "irrigation" to the western country.

In viewing the fertile valleys of the southwest, rich from the fruits of the orchards and the crops from the fields, and dotted with prospercus homes and thriving towns, where a few years ago barren plains starved the cactus and the sage brush, did Mr. McKinley realize that the reclamation of the arid West carries with it the creation of a great and populous empire within our own territory? The wonderful irrigated belts of the West are but an earnest of the transformation of this region, which would follow the inauguration of a policy of national reclamation by which the flood-waters now wasted would be saved for the use of the farmer.

It is hoped that the President, on his trip, has arrived at an appreciation of the question which of all others is most vital to the people of the arid region, namely, water.

Sugar from Water. Henry Oxnard. who may be said to be the original beet sugar man in the United States, says *National Irrigation* for May, states that sugar beets reach their highest degree of perfection, commercially, under irrigation. In sugar content, purity, and yield per acre the greatest excellence is produced by giving the crop the moisture needed at just the right time. The sugar beet industry in this country is a young giant, and the irrigated beet area is rapidly increasing.

Destitute Indians. A recent Arizona dispatch states that the Gila river on the Sacaton reservation is again dry, and this being the source of irrigation no grain will be harvested by the Pima Indians Great destitution, the dispatch states, will ensue, and government aid will be required to relieve the situation.

This was the proposition which Congress was asked to take up last session but refused For centuries—as far back as we have any record—these Indians had grown their irrigaten crops, one of the few Indian tribes which had never cost the United States Government a moment of anxiety. Some years ago the white settlers began to divert the waters of the Gila river above the lands of the Pima Indians; they were even encouraged to do so by the Government. There has not been enough water for both, and as the Indians are not citizens but only wards of the government their rights have been totally neglected and for several years past, as more and more water has been taken out above their crops have been practically absolute failures.

Congress was asked at its recent session to make some permanent provision whereby the Pimas could be restored their birthright—given back the water stolen from them—through the construction of a storage reservoir along lines approved by government experts, but no action could be secured. So the Indians are going on retrograding, being forced to become beg-

gars, thieves, and Government paupers, where once they owned their own farms, reared their own families, and had their own tribal government. It is hoped by every one familiar with the subject that Congress will see the justice, wisdom, and absolute economy of making these Indians self-sustaining through substantial irrigation construction.

Large Irrigation Construction. The government of India is undertaking some irrigation works which will add large areas of reclaimed land to the many millions of acres which the British government has already placed under irrigation. The total cost of this present development will be somewhat upwards of forty millions of dollars. The water used is the melted snows from the great Himalayan range.

Demands Investigation. The time will come when the millions of acres of fertile land now uninhabitable for lack of water will be needed for homes and as an outlet for a rapidly increasing population. With the pressure which is always behind a measure conferring local benefits it will be decided long before the real necessity arises that the people need more room, and as a general principle it can safely be left to the influences of such pressure to accomplish all that is necessary in extending the habitable area. It is equally certain however, that in time money will be spent by the government for the reclamation of arid lands, and in view of this there is one step congress should take which admits of no delay. The possibilities of water conservation should be fully determined, and all government land which will come under the influence of works to be constructed later on should be reserved from settlement or entry.

Irrigation Means Growth. An impression prevails in the east that irrigation will exclusively benefit the west. This is an error. Irrigation will benefit the country from the Atlantic to the Pacific. Irrigation means settlement. The presence of an additional large and flourishing population in the west will lead to an increased demand for eastern manufactures. It is a mistaken policy to retard or delay settlement of the arid lands of the west because somebody believes it will be of no benefit to other sections of the country. Any one familiar with history is in a position to refute such a claim as preposterous.

Irrigation Must be Pushed. There are some seven months before the next session of congress, which will be the long or unlimited session. There were some good little fights made in the recent short and limited session on the irrigation question, and in the common long session there will be some better ones. The West has, in a word, scored, but it has not won, and it must prepare for some vigorous fighting before it can win. There will be no excuse in the next congress for not threshing the subject out. Congress has had its notice and it will not do for leaders to claim that new legislation is being attempted and that there is not time to think out and discuss a comprehensive plan. The best plan in the range of human possibility would be antagonized by some eastern men, but in the future they will be compelled to come out into the open and state their bill of particulars. Generalities will not suffice.

On the other hand, it behooves the people of the West to get together very close on this irrigation question. It behooves them to stand shoulder to shoulder like twin brothers, and to present an unbroken, unanimous front. There are seven months' interim. That period should be employed in smoothing out any differences which may now exist on this subject a ndgetting into absoltue accord upon the policy to be presented by the West looking to its reclamation through government assistance. It should also be spent in organizaaion. Without organization nothing can be accomplished; with organizatio" everything.

Is it to be supposed that the West would today be fighting vainly for its rights if it had been thoroughly organized? Suppose every organization of every kind in the arid States and Territories had con-

cluded to put forth every energy to securing some specific action by the General Goverment, does anybody believe that this action could yave been denied? The West has not put forth its energies in any general way to secure the inauguration of a policy of national irrigation which shall eventually reclaim 75,000,000 acres of desert.

There has been a partial wave of Western enthusiasm this winter on the quesstion of national irrigation.—a realization that the West was not even abreast of the tide created by Eastern manufacturing interests,—and even this has made the subject the most prominent new legislation before Congress.

Now what if the West actually organizes itself this summer and fall—organizes as though this were to be a fight upon which its life depended?

Why the next Congress would simply buckle down to the work and consider the question and pass upon it and act.

And after all the newspapers can accomplish a good half of this work.

Palestine was at one time in a high state of cultivation. By the Mosiac Institute, after the exodus from Egypt, the lands were divided among the adult males, each receiving from 16 to 25 acres. The fields were wtered from canals and conduits communicating with the brooks and streams. When, through the vicissitudes of war and rapine, these irrigation works were destroyed and life rendered insecure, agriculture declined. What was at one time a fruitful land of plenty under irrigation, today is practically a barren waste.

Here is what an Arizonian says of Salt river, which was once known to the country in general only as a mythical stream for the navigation of disappointed political candidates. He remarks: "The most interesting proposition in Arizona to-day is the effort to dam Salt river for irrigating purposes. Within sixty miles of our city the river flows through a deep canyon. By damming the river this would make a natural reservoir. There are fully 1,500,000 acres of land that could be irrigated."

Keep Fighting.

"If at first you don't succeed try, try again," is a good motto, but "*Never Quit*" is a better one. It tells in two words the unyielding tenacity of purpose that will bring success to the national irrigation movement.

In the session of congress just closed the senate fully recognized the national importance of the irrigation movement.

In the Indian appropriation bill the senate amendment appropriated $100,000 to complete the surveys and preliminary tests of the foundations for the San Carlos dam in Arizona.

The chairman of the house committee on Indian affairs, Mr. Sherman, of New York, defeated it in the house and in conference.

The senate increased the appropriation for irrigation surveys by the geological survey from $100,000 to $200,000.

The chairman of the house committee on appropriations, Mr. Cannon, with Mr. Moody, defeated this increase in conference.

They declared themselves on the floor of congress in favor of state cession, though it involved a repudiation of the platform of the republican party in the last campaign. That platform declared:

"In further pursuance of the constant policy of the republican party to provide free homes on the public domain, we recommend adequate *national legislation* to reclaim the arid lands *of the United States*, reserving control of the distribution of water for irrigation *to the respective states and territories.*

These declarations are utterly irreconcilable with state cession.

The senate amendment to the river and harbor bill appropriated about $300,000 for reservoirs in Wyoming and South Dakota.

The bill, as it was prepared by the house committee, carried appropriations aggregating $60,000,000. The senate cut this amount down to $50,000,000.

Twice the bill was sent to conference and twice Mr. Burton, chairman of the house committee, and the house conferees, refused to concur in the reservoir amendments. They were ready to pour money out of the treasury with reckless wastefulness for work on insignificant c

and streams in the east, but unwilling to spend a dollar for reservoirs in the West.

They, no doubt, thought the senate would yield, as it did on the Indian bill and the sundry civil bill, but in this instance they reckoned without their host.

The whole river and harbor bill was defeated in the senate by Senator Carter, of Montana. He held the floor in the senate for the last twelve hours of the session, and mercilessly exposed the methods by which the bill had been made up and the wasteful prodigality with which it appropriated millions upon millions for unimportant or impracticable schemes.

The arbitrary and unreasoning opposition of the chairman of the house committees cannot continue for long to stand in the way of the reclamation of the West. The sentiment of the country favors progress, and this sentiment is rising like an ocean tide, slowly it may be, but steadily and surely, and it will sweep away with an irresistible force the opposition of a few men who seem willing to use their temporary power to stultify their party.

But between now and the next session tireless and unceasing work must be done to broaden the influence and extend the organization of the National Irrigation Association. Success can only come to this great movement through the widespread campaign of education and organization which this association is carrying on.

Impounding Water for Irrigation

During the discussion of the River and Harbor bill in the House of Representatives, Mr. Mondell, of Wyoming, suggested that less money be expended on the Mississippi and Missouri rivers in constructing works for the prevention of overflow, and that it would be better to expend the money in constructing dams and roservoirs to receive the water of the tributaries of those rivers in the arid region and impound it for purposes of irrigation.

Nearly fifty years ago Messrs. Humphreys and Abbott, officers in the engineer corps of the army, were appointed to investigate the physics and hydraulics of the Mississippi river with a view of devising the best plan to prevent overflow of that river and its tributaries. Among the subjects to which they gave attention was the construction of reservoirs to hold back the water produced by the melting of the snow in the mountains near the heads of the Yellowstone, Platt, Arkansas and other tributaries which contribute so largely to the volume that debouches into the sea through the channel of the Mississippi.

Their report was in substances that the plan would have some effect in preventing overflow—nothing was said in regard to the value of impounding the water for irrigation purposes. It was a subject that was not then in the minds of the people, as there was such a vast unoccupied public domain that did not require irrigation to make it productive. The region liable to overflow without preventive works compromises about 20 000,000 acres, and the great thought was to secure it to occupation and cultivation.

For nearly twenty years there has been a Mississippi river commission, created to secure those 20,000,000 acres against submergation, and annually a considerable sum has been appropriated to carry out the plans the commission has devised. The plans comprise building dykes to narrow the channel, where there was shoal water (and it is only shoal where the channel is broad) on the well known principle that narrowing the channel increases the velocity of the current; and its erosive power at the bottom, revetting the banks where necessary to prevent caving, and in low places building levees. These works have been of value in preventing inundation, and in facilitating navigation. These expenditures have been made under the constitutional power to promote the general welfare by aiding navigation and consequently commerce.

It seems logical that if congress has power to protect a section against too much water, it has like power to aid a section that has not enough—that if it is necessary to construct works to preserve land to cultivation by keeping water from it, there is equal power to conserve water to be supplied to land that will otherwise remain nonproductive.

It is a good thing to make 20,000,000 acres available for occupation and productive, but how much better thing it is to extend favor to ten times as much. Expending money to build great reservoirs and creating lakes, more than miniature, would be killing two birds with one stone —it would keep water where it is most needed; and from places where it is not needed and at times is a curse.

If half the sums that have been expended in preventing overflow of the Mississippi bottoms, had been invested in impounding water for irrigation several times 20,000,000 acres would by this time be covered with productive fields and happy homes, that are now wastes, and without occupants. The people of the arid region are digging into the bowels of the earth to find water, and erecting pumping plants to bring it to the surface, but it is not in the larger part of the arid domain that water can thus be obtained, while there is a quantity that comes from above in snow and rain that runs away, rendering little or no service to man. All that is wanted is for man to create the means that will utilize and preserve it. The means required are large and the general government can best afford to supply them. No enterprise now before the American people will so greatly promote the common welfare as to make the arid region habitable and productive to the utmost practicable extent.—*Rural Californian.*

A GREAT IRRIGATION ENTERPRISE.

The *Emperial Press*, California, says: The most extensive irrigation system to be found in America is now in process of construction in the eastern portion of San Diego county, this State.

The land to be irrigated comprises a portion of the delta of the Colorado river, more generally known as the Colorado desert. It is estimated that there are fully 500,000 acres of arable, irrigable lands under the flow of the canals of this system in this State and more than half as much more in Lower California.

These lands are naturally very fertile, being composed of the alluvial deposits of the Colorado river made during past ages. The surface of the country is very level, generally free from brush and usually free from gulches or any other kind of unevenness that would require much expense to overcome.

The Colorado river furnishes the water in abundance. It is stated by competent engineers that there is enough water in the Colorado river to irrigate 8,000,000 acres of land and there is not to exceed 3,000,000 acres to be irrigated within the reach of the waters of that stream.

A peculiarity of the stream is that high water always comes in June and low water in January. The river at the railroad bridge at Yuma is always about nine feet higher the last week in June than it is in midwinter. This gives the most water in summer when the most is required for irrigation, and the least in winter, when little is required.

This stream probably more closely resembles the celebrated Nile than any other river in the world.

The waters of the Colorado river carry a very large amount of commercial fertilizers. A careful study of this subject by the United States experimental station connected with the Territorial University of Arizona demonstrates the fact that an acre foot of water from this river contains commercial fertilizers to the valued at $3.41. So that a tract of land irrigated during the season with water enough to cover the ground three feet deep would receive fertilizers to the value of over $10 per acre, and this fertilizing material would cost nothing extra over and above the cost of the water.

It is this kind of material that has made the soil of this great delta, and therefore it is very fertile and must of necessity forever remain.

so when irrigated by this water—no matter how much it may be cropped.

This being the character of the land and water, the next thing is to bring them together.

Public attention has been directed to this great desert for the last half of a century.

In 1856 Dr. O. M. Wozencraft of San Bernardino commenced his work of exploring the desert and preparing plans for reclaiming it by means of water from the Colorado river. He applied to Congress for a land grant to assist in the work, and secured a strong endorsement from the Committee on Public Lands of the House of Representatives. He also applied to the State Legislature of California and secured the state's interests in the lands of that county, but the civil war of 1861-5 put an end to this program and the project was allowed to sleep until the past few years.

In 1896 the California Development Company was organized under the laws of the State of New Jersey, with headquarters in New York City. This company purchased the Hanlon Heading on the Colorado river adjoining the international boundary line, purchased 100,000 acres of land just below the line extending from the Colorado river on the east to the mountains on the west, in order to secure a right of way for the canal, and spent many thousands of dollars in surveys for the canals from the river to the lands to be irrigated in what was commonly known as the New River country.

Early in 1900 this company was reorganized and its headquarters was moved from New York City to Los Angeles. George Chaffey became president of the company and its Board of Directors was selected with a view to pushing active construction of the irrigating system.

C. R. Rockwood, who had spent eight years of his life in studying this problem, much of his time in the field, was retained as chief engineer of the reorganized company.

In order that the entire energies of the Califofornia Development Company might be devoted to the construction of the irrigation system, the Imperial Land Company was organized to act as an agency to colonize the lands to be reclaimed. S. W. Fergusson was made general manager of this company, and the work of opening up the desert was begun in April, 1900, and this work has been pushed ever since.

A hotel was built at Flowingwell Station on the Southern Pacific railroad—this being the most convenient station to be used as a base of supplies.

A camp was established at Blue Lake, about forty miles to the south, and a stage line was inaugurated between these two points.

The country between Salton river on the east and New river on the west was surveyed, as most of the stakes and mounds of the original government survey had been lost.

Imperial water Company No. 1 was incorporated as a mutual water company to secure water for its stockholders from the California Development Company. This company was intended to irrigate 100,000 acres of land located between the two rivers mentioned.

Imperial Water Company No. 2 was incorporated to irrigate about 90,000 acres of land north of No. 1.

Imperial Water Company No. 3 was incorporated to irrigate about 25,000 acres of land near the boundary line.

Imperial Water Company No. 4 was incorporated to irrigate 12,500 acres of land originally included in the territory of No. 2 company.

Recently Imperial Water Company No. 5 has been incorporated to irrigate 100,000 acres of land on the east side of the Salton river, which tract is now known as Eastside.

All of these companies are mutual in character, having been incorporated to furnish water to their stockholders only at cost, so that no one could get water from any of these companies except by purchasing stock in one of them at the rate of one share to each acre of land. A contract between each company and the California Development Company provides for a perpetual water supply delivered at the international boundary line at a cost of fifty cents per acre foot, or about two cents per inch for a twenty-four hours' flow.

The stock of these companies was to be sold for the benefit of the California Development Company and for the creation of a fund to construct the distributing system of canals and ditches for the several mutual companies.

The water stock of the various companies is being sold at $11.25 per share.

Under this program for cheap land and cheap water rights, and cheap water rights perpetually, people began to flock to the desert and secure lands and purchase water stock.

During the past year over two hundred persons have secured land under the desert act and taken water stock for the same in the various companies.

A number have also taken up homesteads and purchased the water stock. Some have taken school lands and others have located Forest Reserve scrip. In all over 100,000 acres of land have been secured by those who have purchased water stock for the same.

The town of Imperial has been established about twenty-eight miles south from Flowingwell, between the Salton and New rivers, on the road to Blue Lake. Here a general merchandise store has been established by W. F. Holt; a hotel has been opened for accommodation

of the traveling public; lumber is on the ground for a church building and the services of a minister have been engaged.

W. F. Holt is building a telephone line which will be completed from Iris, telegraph station, via Flowingwell to Imperial in a few days.

Imperial has been formed into a school district, and it is the intention to erect, the present season, a school house to cost $5000, as it is estimated that the school next winter will require two teachers. This large school district, which is about fifty miles square, will have to be cut into several smaller districts next year.

In the hills to the west of this great valley, the out-cropping and seepages of oil are said to be the very best to be found in the State, and during the past few months over 500,000 acres of this oil territory have been filed upon for oil purposes, and already several rigs are at work going down deep for oil. In one well, at a depth of 400 feet, a supply of artesian water was struck. This was at the junction of the Carriso and San Felipe creeks, on the western edge of the desert.

As regards climate, in summer it is hot, in winter, fall and spring it is delightful. The summers are about the same as those of the Salt River valley in Arizona. The nights as a rule are not too warm for comfort in the summer months. The atmosphere is so very dry that the heat which at mid-day runs above a hundred in the shade for weeks at a time, is not oppressive.

As to crops, this will be a general farming country, with alfalfa a staple, and the fattening of cattle will be a leading industry. This will be the greatest cattle fattening country in the United States. More cattle can be fattened here on a given area and at less expense than in any other known section.

Eventually it will be an early fruit country. This industry will develop gradually. It is probably too cold for citrus fruits in most localities, but deciduous fruits and raisin grapes will develop here to perfection.

So much for the country, the soil, the climate, the productions and the work already done to make this country habitable, but nothing will succeed without water.

The California Development Company commenced work last August on the main canal at Hanlon Heading on the Colorado river.

A large dredge was purchased, having a capacity to handle 3,000 cubic yards of dirt every twenty-four hours. This dredge, which is forty-five feet in width, has worked its way down towards the Salton River channel, digging the canal as it went, for a distance of nearly ten miles, so that now the water is running down from the Colorado river through the canal into the Salton river channel to a point where it is being diverted into the canal again near Cameron Lake, about fifty miles from Hanlon Heading.

A hydraulic dredge has also been constructed with which to pump the silt, that may settle from the water, back into the Colorado river again. This dredge is now at work near the temporary heading of the canal. The permanent heading has not as yet been constructed. Below the permanent heading there will be a large settling basin in which all the coarser matter in the water will settle. This basin will be about half a mile long by a quarter of a mile wide. The lower head gates now being built are located just below this basin, and a temporary heading a mile below the permanent heading and just above the lower headgates is now being used to take the water from the river into the canal.

For several months past a large force of teams and Fresno scrapers has been at work constructing the main canal that is to furnish water to that portion of the desert between Salton and New rivers. This main canal is seventy feet wide and will carry four or five feet of water. By the first of June the water will be at the town of Imperial and the distributing canals will be completed as rapidly as possible, so that by next winter those who are located between these two rivers will be able to have the water delivered to their lands. Many of the settlers will be able to procure water this summer for summer crops, such as sorghum, Egyptian corn and other similar crops.

Recently a steam excavator has been brought to Imperial and will be set to work to assist in dredging the distributing system of canals and ditches, and the work will now progress more rapidly. The work with teams has been very expensive, as hay has cost $30 a ton and grain $35 a ton, and with feed at these prices, one hundred and seventy horses have been kept busy on the works for months. This has been in addition to nearly as many more employed on the canal near the Colorado river.

During the past year an immense amount of work has been done under great difficulties. The worst is now over. The water will soon be delivered. The public confidence in ultimate success has been extraordinary.

It was hoped that the water could have been delivered to the settlers in time for active work in cultivating their lands this season, but unforseen obstacles delayed the work for a few weeks beyond the appointed time.

This is the record of a year's work. The public are asked to scan it carefully and pass judgment

EARLY IRRIGATION.

The most prominent feature in the history of the gradual growth and development of man, is agriculture. Having its origin in necessity its development of man is agriculture, advancement to the highly civilized plans he has obtained. Beginging with the use of nuts fruits, roots and game obtained in the wild state, the requirements became more exacting, for man is in nature never satisfied. The resort to planting and growing for themselves the different fruits which the early inhabitants of the earth had been accustomed to use, was but a natural outcome of observing how seeds sprouted, grew and produced the very articles of diet with which they were familiar. The increase of population in the "Cradle of Man," gradually forced the weaker tribes into the great deserts to the west. Here they encountered the hardest conditions, finding nature against them in a land where water was scarce and where no vegitation could grow except in the immediate vicinity of springs. It was under rigorous conditions that the desert tribes lived and grew in numbers and strength.

By reason of their surroundings and the hard struggle for existence, these people became fatalists. Under the later influence of the Koran their fanatical instinct were aroused and they went forth to the conquest of the world, to convert all to the doctrines of Mohammed. They are today a sturdy wiry race, but from the first their training has been in the hard school of adversity. Theirs was not a land flowing with milk and honey, but what they raised was by the abundant sweat of the brow. The culture of their simplest necessities meant indefatigable and patient labor.

From time immemorial irrigation has been practiced by man in aid of agriculture; in fact the birth of agriculture was in irrigation. The idea undoubtedly originated in the apt illustration afforded by the oases in the deserts. Here, with surrounding sand, hot, blistering, drifting sand, absolutely devoid of vegetation, the hardy sons of the desert were wont to seek the grateful shade. Beside the springs they could lie in the shadow of the date palm, and sleep the sleep of the weary, rising, refreshed and ready for the next journey which was measured from oasis to oasis. It was but natural for man to observe that where springs and water were plentiful vegetation throve. By the cultivation of the larger of these oases they raised the food necessary for their simple diet. When they needed more land for agriculture, it was but natural to attempt to moisten the soil. To secure water for this, wells were dug. From these the water was drawn by

hand and carried in leathern bags to the little patch which they intended to cultivate.

Where the desert extended along the banks of a river, as the Nile or the Euphrates for instance, the water was plentiful. It but needed to be applied to the land to procure the crops needed by man. The sculptures of ancient Egypt contain figures of men with a yoke upon their shoulders bearing water pots. This was of course only possible where the water was near at hand. Sculptures of a little later date shows the use of the bucket and lever—known as the shadoof by the Arabs—the simple well sweep of our older country homes and still used for irrigating in many parts of Egypt, Arabia, Persia, and India. It consists of a pole pivoted upon an upright with a skin bucket fastened to one end and a weight upon the other. With this the water can be raised to the height of eight or ten feet into a trough from which it flows into a small tank or surface reservoir. Where the water has to be raised to a great height it is accomplished by a series of shadoofs, one above the other, each depositing the water in a tank immediately above, from which it is again raised eight or ten feet and so on until it is finally on the level of the land sought to be irrigated.

As civilization progressed, ditches or troughs by easy transition, replaced the man with the bucket as the means of leading the water into land. Ridges a few inches in height were raised around small patches of ground and the water was permitted to run in until the soil was covered when the gap was closed in this square and an opening made in the next. After a long apprenticeship man gradually acquired a knowledge of mechanics and the application of the forces of nature to his own ends. Crude water wheels were constructed which were propelled first by human labor and later by oxen, cows, donkeys or camels and finally by the current of streams.

The need was water! water! water! No matter how laborious the task,, water must be gotten. So by these methods, against overwhelming odds, man's struggle with the forces of nature has continued for untold ages. And today, through the application of the principles discovered by our predecessors in irrigation, we see millions of acres of soil, worthless otherwise, reclaimed and made fruitful. Experience has shown that where the water is under control better and larger crops can be produced than on lands where nature has been most bountiful in furnishing rainfall. In the latter regions, rain often comes at inopportune times and again fails just when most needed by the maturing crop. Failure or partial failure is frequent in the most favored regions; under modern systems of irrigation it is impossible.

IRRIGATION IN PERU.

Senor Raman Estacia, who is a visitor to this country from Peru, can talk very interestingly about his home under the equator, the land of the Incas. "I am in the United States," said Senor Estacia, "to study the results of your plunging civilization and to note those American inventions which would help us in my country. The discovery of America destroyed Peru as it did Mexico. The Peru of today is a small part of the ancient empire. At the time of the conquest, the Spaniards found the land in a high state of cultivation. While naturally in a large part a desert, owing to very scant or no rainfall between the mountains and the coast, the natives by their superior wisdom and foresight of their Incas had brought water immense distances and rendered arable vast stretches of country. The ancient irrigation of Peru was very wonderful.

"Water was conducted by means of canals and subterraneous aqueducts executed on a grand scale. They were built of large slabs of freestone nicely fitted together with cement. The water supply came from some elevated lake or natural resorvoir in the heart of the mountains, and was fed at intervals by other basins which lay on the route along the slopes of the sierras. Passages were cut through rocks (and the Peruvians had no iron tools) and almost impassable mountains were turned; rivers and morasses were crossed and apparently impossible feats of engineering were accomplished simply to secure water for the irrigation of fields and gardens. Some of these canals were very long. That of Condesuyu was between 400 and 500 miles in length.

"By latent ducts or sluices, the life giving fluid was led to the tillable lands along the line of the canals. In some instances the land was flooded, while in others the water was made to run in furrows between the rows of growing maize, tobacco and other crops. Each occupant of land was allowed a certain quantity of water by the law of the empire. Overseers for the government had charge of each district, and saw that every man received his proper amount, and test the canals were kept in repair.

"That the government understood the dangers of floods and took steps to prevent them, is shown by some of the works still extant. Notables is the still visible tunnel near Casamasca. While the waters of this were used for irrigation, the heavy rains and melting snows of the mountains would cause an overflow. To protect the irrigation works and the settlements along the route, a tunnel was excavated in

the mountains to give an outlet, in another ditection, to the waters of the lake when they rose to a height to threaten inundation.

"At the coming of the Spaniard, the land eyerywhere teemed with evidence of agricultural wealth," said Senor Estacia, reflectively. Today the greater part of this paradise has reverted to its original arid condition. Here and there where some old dirt filled and long-forgotten tunnel leaks a little moisture, the rank vegeatation of our tropics, in contrast with the surroundings arid wastes, shows the power of irrigation.

This gives rise to the reflection that the Spaniards, wherever their star of chivalry or repacity for wealth led them, have destroyed and never created. Their coming has always been a curse to the people they conquered. Chivalric and recklessly brave, they yet considered the civilization and population of the New World as but barbaric and pagan and fit only for destruction.

But these native people, benighted and heathen, had battled with nature, learned the most adverse circumstances. They made use of mountain lakes and natural reservoirs, wherein were stored the waters of the rainy season and the melting snows, to be used during the dry season.

We have today in California, Colorado. Arizona, New Mexico, Utah and the Northwestern States, millions of acres of land. the productive capacity of which is beyond compute, which can and will be reclaimed eventually. Great mountain gorges forming natural reservoirs, can be used for storage purposes, and the land, today will become an empire of agricultural wealth, worth far more fabulous sums than the rich mines adjacent to them.

MINNESOTA FOR IRRIGATION.

While nature has poured forth her waters so copiously over Minnesota that its 7,000 lakes and numerous water courses leave it no direct interest in the extension of the irrigation systems, it has a close interest in a wisely conceived and economically executed policy of irrigation, says the *Pioneer Press.* Montana, Idaho, and Washington are all tributary, in a business sense, to this State.

The growth of their populations and the prosperity of their peoples are important factors in the growth and prosperity of Minnesota. A national policy that promises to cover the arid lands or the reclaimable portion of them with prosperous cultivators and their families is, therefore, a policy of considerable importance to the Twin Cities and other communities in this State.

In Montana alone there are some 93,000,000 acres, of arid land practically uninhabitable and worthless. But of this area it is estimated that 10 per cent., or some 9,300,000 acres, is capable of reclamation. There is, in other words, sufficient water available to convert this area into fertile farm land.

It has been estimated by those interested in this project that this area, on the theory that forty acres would support a family of five, would make room for a population of 1,165,000. This estimate of eighty people to the square mile is not intended, of course, to represent the immediate population that would take homes on the reclaimed area. It represents the capacity of this land, and considering the popularity of such lands is by no means impossible that such a population might at no distant day be found on what is now practically a desert that contributes nothing to the wealth of the Northwest and takes nothing from it.

Big and little industries throughout the country, from the railroads to the individual laborer, have something to gain from the development of these practically empty and waste regions of the Western States.

In one sense it is no less important than the encouragement of railroads, one of whose principle functions is to establish new communities and make business for the older ones. A railroad to the heart of Sahara could not enrich the community from which it started. Population is the foundation of all business, and every family settled in the regian tributary to Minnesota's railways is so much gain to Minnesota.

DISASTROUS RESULTS FROM DESTROYING THE FORESTS OF NEW YORK AND PENN.

NOT ONLY AT HOME BUT CLEAR TO THE EAST.

By C. B. Parker.

Nature's laws versus man's selfishness and covetousness.

Under the former all things work for good and in perfect harmony; under the latter the equilibrium of order seems lost in chaos and confusion, discord and too often calamity follow in the train of wars, pestilence, famine, drouths, floods, etc.

After an absence of more than fifty years from our native land, New York State, the writer was privileged to spend the last year in the haunts of his boyhood days from Rochester, N. Y. to Binghamton and in Northeast Pennsylvania at Williamsport, Troy and Tomanda. We were surprised at the climatic changes as wrought by the denuding of the grand old forests of pine and hemlock with the irreparable and disastrous results of controverting those stable and useful mountain streams from useful mill power and stock water as well as being notorious the world over for their finest of trout fishing. Under nature's or God's plan the great forests of timber held the heavy snow fall of winter as a gradual reserve of supply for these streams, and it melted gradually during the spring and supported the streams to a nice flowing condition of usefulness all the seasons, and the hum of the mill was heard the year round in every neighborhood, and great was the sport in fishing for the speckled trout; but, alas, the greedy lumberman has stripped the hills of timber, and the snows now melt all of a rush with the spring, and the little streams once so placid and useful now are wild rushing torrents, overflowing their banks and destroying property for a time, and as the snow is gone they run dry and present only a rocky bed the balance of the year, not even affording stock water, and many a natural spring and good well has "gone dry" during the past two decades; and notably, nature ever true to the laws of cause and effect, just in proportion as these floods have prevailed in the north so have our rushing streams caused the Ohio, the Mississippi and their tributaries to overflow more than in earlier days.

And now for the remedy. Unfortunately this generation can receive but little comfort or relief, for it hath been written, "the soul

that sinneth it shall die." "The sins of the father are visited unto the third and fourth generation," etc., but it lies within us to do much to relieve the hardships we have imposed upon generations yet unborn by constructing dams in thousands of those northern and New England hollows and holding in store for later in the season much of the spring overflow thereby avoiding the rapid swelling of the streams below. Also the forests should be protected from further extermination, and every man as he fells a tree should plant two and keep them alive, and while growing a forest may seem discouraging as a slow process, let us bear in mind those we have destroyed were once planted for us, and it matters but little by whom.

But the quickest and greatest relief that has suggested itself to the writer for those along the Mississippi delta is possible by adapting Col. A. Hoagland's patented steel ship canal or aquaduct to a system of relief by tapping a river at different points and relieving of its overburdened supply of water and conveying in another direction; for instance, at a point about 100 miles above New Orleans on the Mississippi, from La Place to Lake Poutchertrain is but four and one-half miles, and this lake is on a level with tide water at the Gulf, or nearly so. Now while it would not be practical to open the level and dig a ditch or canal to drain off a portion of the river to relieve the congested condition from here to New Orleans, but the writer fully believes it to be entirely practical and perfectly feasible to open the land at a point say ten or twelve feet below the danger line, and place Col. Hoagland's canal or aquaduct on the surface of the ground, say 300, 400 or 500 feet wide and ten or fifteen feet deep, and thus drain off water sufficient to relieve all danger of overflow below this point, and the loss to crops and money expended by government one year would pay for and complete the aqueduct.

After a careful examination of Col. Hoagland's aqueduct and a conversation with different civil engineers that pass upon it as a practical invention, we fully believe it is a means capable of proving a solution of this problem that has cost so much of time in Congress the past twenty years, and so much of money with so unsatisfactory results.

LOUISVILLE, KY., April 20, 1901.

Editor IRRIGATION AGE, Chicago, Ill., *Dear Sir:*—I have with more than ordinary interest noticed in the February number of the AGE, communications on irrigation by Gen. Nelson A. Miles, of the United States army; one by Ulrich, your own editorial and still another article by Dr. C. D. Parker, all of them, to some extent, grouping the results of the recent irrigation convention held in Chicago, and each one referring to the importance of calling on the government of the

United States to assist the inhabitants of the "irrigation states," Arizona, New Mexico, Utah, Nevada, Wyoming, Colorado, Oregon, Washington, Western Kansas, Nebraska and Texas, in utilizing some portion of the melting snows and storm water by housing the same in reservoirs for irrigation.

There seems no longer any doubt about vast bodies of sheet water underlying much of the land comprising the states referred to. These facts are confirmed by the construction of some ditches paralelling the streams in the valleys they traverse, and so far these are the results of private corporations. They serve, however, to confirm the existence of sheet water. This sheet water comes from two sources–living springs of water throughout the Rocky mountains, and from rains and the melting of the snow. The springs as a matter of course, flow the year around, and constitute the main supply of sheet water and is, as a matter of course, flowing day and night. The additions of rains and snow occur only during the heated months of the spring and summer, but in order to give the inhabitants of each state a part of these waters it is conceded to be the duty of the general government to devise some means for getting at the real body of water and bringing it to the surface of the ground, and then by some means distributing it to the farmer.

The method that is being discussed more fully than any other at the present time, is the building of reservoirs and storing these storm waters from snow and rain and holding the same for distribution through ditches among the farmers during the irrigation season.

I perhaps feel a little more interested in the article of Dr. Parker than the others, as I am the inventor of the maratime aqueduct canal and the water elevator referred to by Dr. Parker, as a means for bringing the sheet water to the surface of the ground and putting it into a concrete channel that guarantees no loss from seepage. I am now solicited for a description of my plan for getting at and concentrating on the plains for irrigation, this sheet water where it is nearest the surface of the ground.

I have this to say: excavate to within a few feet of sheet water a series of open cisterns or reservoirs, 40 ft. square and then dig ditches of equal depth for half a mile to the right and left of these cisterns, and in these ditches drive into sheet water say 10 ft. apart, lines of drain pipes with strainer. These ditches will have foundation and walls of concrete, making a slight fall from the outer end of the ditch to the reservoir or cistern, thus causing the water as it flows from each drain pipe to enter the cistern, from which water elevators will lift the water into the irrigation canal. I am assured by persons familiar with sinking wells on stock farms and ranches in Nebraska and Kansas, that is a majority of these wells the water is reached through drain

pipes driven into the sheet water, and the deeper they go the stronger the flow of water. In many cases the water rises near the surface of the ground, and if, as I suggest, concrete cisterns were constructed before the drain pipes are driven into sheet water, these wells become artesian and the water will flow over the floor of the cistern and it is by this means the government will get at the flow of water in the mountain springs and from rain and melting snows of the Rockies.

These concrete irrigation canals need not be over six or eight feet deep, and perhaps not that depth, by 30 or 40 ft. in width. Judging from the experience of concrete pavements, the expeuse of these canals need not be over $10,000 per mile. Now that the government has received from the owners of these lands their value and they are not remunerative for the want of moisture, it would seem to be the duty of the government through irrigation to aid in making them available for raising a crop.

Again, the certainty of a crop under a ditch, the owner of each farm would gladly pay a tax of $2.00 and $4.00 per acre to the government for water, and the government would in this way be reimbursed to some extent for the outlay in building the concrete canal. I cannot imagine any duty on the part of our government more sacred than putting within reach of the toiling millions of the farms in the states we have referred to, the means with which to make a living, while they do live, and when the farmer dies leaving his family in posession of the means of maintaining his wife and children.

I can only say, let the government construct a few miles of concrete canal, build a reservoir with side ditches and sink in the same, drain pipes and bring the sheet water to a given center, and by means of elevators, lifting the water into the ditches in any desired quantity. We shall no longer be experimenting by sending into the clouds balloons and exploding dynamite in vain efforts to force rain from the clouds, especially when there is within ten and twenty feet of the surface of the ground on territory extending fully 1000 miles each way. an abundant supply of water for grain, grass, garden and fruit harvests.

ALEXANDER HOAGLAND.

KANSAS CITY, MO. April 23rd, 1901.

MR. ALEXANDER HOAGLAND, Louisville, Ky. *Dear Sir:*—I have beeen dealing in and selling pumps and sinking wells in the various parts of the country for the past 13 years. I have examined your newly devised plan for concentrating sheet water in reservoirs by means of bringing up the sheet water through a series of strainers or drive points, and am convinced that the plan is entirely feasible, and I can see no good reason why the government should not give the de-

vice a practical trial and test in connection with building reservoirs in some of the irrigation states. It has long been known to dealers in wind mills that when wells are driven in sheet water in western valleys, the fountain head being above the pipes the water of its own gravity will flow up and out of the pipes, and if they are used on an extensive scale, the supply of water thus received would readily irrigate large bodies of land. I wish you the entire confidence of the government in your simple and feasible plan of making the water available in all of the irrigation states. Your constant efforts in devising a mode of making the vast lands which are almost a desert into valuable farming and stock raising farms should be highly commended by the thinking people of the entire west.

Yours Truly,
BRINTON PUMP & PLUMBING CO.
(Signed) G. G. BRINTON, Prop.

ALMOST.

Did you ever live in the land Near-By
On the fringe of the forest they call Almost,
Where the ships drift homeward from By-and-By
All laden with wishes from the Wonder Coast?

Where the music is sweeter than Ever Was,
And flowers are fairer than Ever Could Be,
Where the only language is Ohs! and Ahs!
To tell of the beauties we *almost* see?

From this blest invisible land Beyond,
Just over the border of sorrow and stress,
Come notes of a nocturne memory conned
Like the lingering joy of a dream caress.

Did ever a soul in its farthest flight
Wing its way to the wonderful city Somewhere
On the shore of this shadowy country quite?
Yet ever and always we are *almost* there

THE DIVERSIFIED FARM.

In diversified farming by irrigation lies the salvation of agriculture.

CITY MILK.

Chicago physicians have long felt the need of pure milk for infants and invalids, but much feeling has not resulted in much activity. Doctors are not hasty about going into the dairy business. There is at least one dairyman, however, who has given ear to the doctors' great need, and has given much attention to suggestions made by the Chicago profession. This man is Mr. H. B. Gurler, a dairyman of 20 years' experience, and a man of very unusual observation.

"Pure milk" was a subject of mutual interest and discussion between Mr. Gurler and a number of physicians at the May meeting of the Chicago Medical Society. It is the object of this article to report some of the most important things brought up at that meeting.

Cattle should have wholesome food; well ventilated barns during the winter months, and open range in summer time. Cows fed upon decaying vegetables, distillery slops, and supplied with water containing decaying animal and vegetable matter, give most unwholsome milk. Cows which are suddenly changed from ground to pasture food frequently cause diarrhœa in the nursing calf, and likewise an infant may suffer gastro-intestinal derangement by feeding on milk from such cows. On account of reproductive influence, cows should be milked no longer than a period of nine months, until another calf is born.

Among other sanitary conveniences of the barns of Mr. Gurler's dairy are ventilation pipes, sewerage and cement floors, which floors are flushed daily. Milking is performed in a most cleanly way. Sometime before milking the cows are groomed, the udders are washed, and milkers are required to wash their hands. The milk pail is cov ered with a fine strainer, containing absorbent cotton, so that straining is performed in the act of milking. The first milk in each teat is rejected, since bacteria may be found in this first milk. All utensils used in handling milk are sterilized by steam in a sealed room, the temperature of which is kept at 212° Farenheit for 30 minutes. As soon as the milk is obtained, it is run through a centrifugal machine to separate cream. The object of this process is to enable the dairyman to so mix the cream and skim milk that milk containing 4 per cent fat may be obtained. The separator also eliminates mucus, or any foreign matter that may have gotten into the milk. The milk is then cooled to a temperature of 45° Farenheit; bottled, wood pulp stop-

pers being used, and date of bottling is stamped on each seal. The milk is kept at a temperature of 35° Farenheit till delivered to consumer. It is from 12 to 36 hours old when received by customers.

In order to aid the physician to prescribe any desired percentage of fat, proteids and sugar, a table has been printed on cards for direction in the use of definite quantities of Gurler's milk, 16 per cent cream and sugar. The quantity of modified food which can be prepared according to this table is limited to 24 ounces. Mathematical calculation proves this table to be very accurate, and correct results are obtained in desired percentages by following the direction of it.

Regarding tuberculosis among his cows, Mr. Gurler says: "I have seen many cows that no one would suspect, react to the tuberculin test, and prove to be tuberculous at the post mortem. At the first test of my herd, 3 per cent of the 133 cows were found to be tuberculous. Once each year the tuberculin test is applied to this herd, and percentage of diseased cows, each time, is much below the first test, owing to the care taken in keeping tuberculous cattle away from the heard. Cows thus diseased are promptly killed.

Veterinarians consider the tuberculin test very satisfactory, and are striving for larger privilege in examining cattle. Just here the physicians have an important interest also, and, when possible, should aid the veterinarians in obtaining such privilege. It is easy and very important for physicians to recommend to their patients those dairies which are under veterinary inspection. Every physician meets with a large number of cases of tuberculosis where hereditary history throws no light upon the etiology of this dreaded disease. This applies especially to tuberculosis ostitis, so frequently afflicting children. Tuberculous milk is certainly a great source of infection.

The following are causes of impure milk, which is the kind sold by ordinary city milk dealers:

1. Unhealthy cattle; improper food and care of cows.
2. Uncleanly milking and care of dairy utensils.
3. Impure atmosphere where milk is kept in small stores. Small dealers also water and drug their milk.
4. Old milk, which is more difficult to digest and is more favorable for growth of bacteria.
5. Long distance transportation which increases age of milk from 24 to 72 hours and so agitates it that the proteid and fat are rendered more indigestible.
6. Warm temperature which favors growth of bacteria.
7. Improper care of milk by consumer.

THE CULTURE OF PECANS.

The pecan is one of the most profitable nuts that can be grown in the Southern and Western States where the soil and climate are both adapted to such trees. The tree begins bearing at an early age and

continues for an indefinite period without requiring much care in pruning. Paying crops may be harvested when the trees are from eight to ten years old. The trees will yield from one bushel to twenty every year during the lifetime of the planter. The nuts are always in demand at prices ranging abont one dollar per bushel when sacked or barrelled for the market. As the trees may be set as closely as an apple orchard there is certainly money in the planting of such a grove, in addition to the value of the timber which is equal to almost any of the hard woods for commercial uses.

Pecans belong to the hickory nut family and are always in demand on the city markets. The trees are forest plants growing to the height of 75 to 150 feet, having wide spreading branches and oval top that make them ornamental as well as profitable. Nuts are borne much the same as the hickory and are ablong in general appearance. They vary in size so that the weight ranges from 25 to 100 for a pound. The shells are very thin making the nuts easily cracked. The trees are native to the country south of parrallel 40 in the United States and are rapidly coming to the front as commercial productions. Texas, Kentucky and Missouri are noted for wild pecan growth but the commercial world is supplied almost entirely from Texas, Louisiana and California.

The soil best adopted to pecan culture is probably the sandy loam of river and creek beds, where there is plenty of leaf mold and the plant food necessary for hard wood trees. Experienced men report sandy loam with clay subsoil the best while the lands of swamps comes next in importance. The clay soils give earlier crops but the nuts are small and unsaleable.

This tree. like all of the hardwood varieties, needs liberal supplies of Potash, and it is well to make annual dressings of not only Potash, but Phosphoric Acid and Nitrogen as well. One lb. each of muriate of potash and Acid Phosphate and ½ lb of Nitrate of Soda per tree would suffice. The best way, though, in fertilizing any orchard is to fertilize the entire area and for this plan, about 200 lbs. of Muriate of Potash and 300 lbs. Acid Phosphate and 150 lbs. of Nitrate of Soda per acre would be a good application. The Potash and Phosphoric Acid can be broadcasted and worked well into the soil, and the Nitrate of Soda used as a top dressing.

Pecans may be propagated from seeds which can be planted the same as other nuts. Probably the quickest and cheapest plan is to transplant nursery grown trees. They may be purchased at reasonable prices from those having nut trees for sale. Small ones are the most preferable as they will live better. Forty feet apart is wide enough to plant the trees. This will give 40 trees to the acre and insure from 200 to 1000 bushels of saleable nuts every year after the trees come into good bearing. Clean cultivation is necessary for the first few years after planting a grove. If the space between the trees is planted to cowpeas, velvet beans, melons or similar crops and a complete fertilizer used on the cover crops the trees will hasten to maturity and become profitable in a few years. As the trees develop the cultivation between rows may cease but it is necessary to continue feeding the old trees with plant foods.

There are several varieties of pecans coming from improving the old native trees. The Stuart, Van Deman, Centennial and Frotcher are the most popular. The points to be considered in planting any varieties are the quality in flavor, plumpness of kernel and soft shell. Trees should be planted so as to assist in fertilizing the blossoms of those that otherwise would not bear fruits. Sometimes grafting of superior varieties is successfully accomplished, but it is better to get only first class trees at the start and care for

them properly and thus be insured good profits when they bear.

THE VELVET BEAN.

The velvet bean is one of the most remarkable legumes ever introduced in the southern states. It came originally from India as an ornamental vine and has suddenly become prominent as a forage plant and soil reviver os great worth, Under favorable conditions the vines grow 30 to 50 inches in length and yield two to three tons of excellent hay per acre. Some farmers have harvested 30 bushels of beans from an acre and secured profits greater than any other bean or pea crop. As a fertilizer there seems to be nothing equal to the velvet bean, and the part it is destined to play in agriculture is certainly a subject of commendation.

A light sandy soil is best suited to the velvet bean, and the richer it is in humus and plant food the better. Fall or winter plowing is advisable, and early spring planting is more successful than later in the season. A bad, weedy field can be easily and cheaply reclaimed by sowing to velvet beans as the vines will choke out all foul weeds and grasses.

This plant belongs to the legume family and possesses a common property of drawing its own nitrogen from the atmosphere. In fertilizing the bean, therefore, only phosphoric acid and potash have to be applied; from 15 to 20 lbs. muriate of potash and 300 to 400 lbs. acid phosphate per acre would make a good annual dressing for the velvet bean. These materials can be well worked into the soil and they will promote a heavy growth of the crop which means an absorption of a large quantity of nitrogen and organic matter.

The velvet bean is a small mottled brown and white seed which is very rich in protein. It grows in pods borne on clusters two to three feet apart on the long vines. Each pod contains from three to six beans. A long season is necessary to mature the beans, hence the crop is more profitable in the extreme south. The value of the vines for pasturage in the fall and plowing under as a green manure is so great that it pays well in the central and northern states. Many analysis of the vines have demonstrated their richness in soil foods. An illustration comes from the Louisiana Experiment station where 4,113 lbs. of velvet bean vines and leaves contained 93.4 pounds of nitrogen, while the roots and fallen leaves were equally rich in this plant food.

In planting the velvet bean many prefer drilling in rows four feet apart, dropping beans in hills two feet apart. About two inches is sufficient depth to cover the seed. If the soil is rich the distance apart in rows may be made to five feet and the hills widened to three feet. In the northern sections of the country the seed may be planted more thickly than in the south as the vines will not grow so rank, and beans are not expected to mature. The chief uses of the northern crop are for pasture and hay, but the beans are valuable even for these alone, without any seed ripening. Where the vines grow thrifty a disc harrow or rolling cutter will be necessary in plowing under the crop for its fertilizing qualities.

As a food product the velvet beans are relished by many people. They are more difficult in threshing and cleaning than the ordinary field pea or bean. If ground and used for feeding cattle, sheep and hogs, the bean meal makes a rich concentrated food equal to any of the peas or beans. About sixteen quarts of seed will plant an acre at the average distance suggested for hills. The seed may be obtained from any southern dealer at prices ranging about five cents a pound. On account of its method of collecting nitrogen from the air it is a fine cover plant for orchards and vinyards. There is probably no single plant that will be found as profitable for enriching the space between

trees and at the same time driving out obnoxious weeds and grasses.

JOEL SHOMAKER,

BOOM BEET CULTURE.

C. F. Saylor of Iowa, the special agent in Chicago for the beet sugar investigation of the department of agriculture, has submitted his report to Secretary Wilson He says this year shows a very active tendency toward the institution of new beet sugar enterprises. Next autumn, he says Michigan will have three new factories and Ohio, Indiana, New York, Colorado, South and North Dakota and Illinois will install new factories, making 138 throughout the country now in contemplation. A conservative estimate, he says, is that there will be forty-two beet sugar factories in operation throughout the United States by the end of next autumn. Everything indicates that the industry is thoroughly established throughout the country. Even in the incipiency of the industry the factories have shown good profits. They have maintained themselves without any apparent real contest with the sugar trust. The sections of the country that seem most adaptable to the industry are where conditions call for new resources, as in Michigan, where there has been a large increase in the last three years, largely due to the waning of the lumbering industry of that region. There will be fourteen factories there next season, California is the leading state in production, with eight factories, including the largest in the world. The immense amount of pulp and refuse left after the extraction of the sugar appeals especially to the farmer and the corollary industries that grow out of farm products. No feed is so valuable and so cheap for the dairy and stock-feeding in this country as beet pulp. These factories turn out from 45 to 50 per cent of the original weight of the beets worked in the form of refuse or bi product. Sugar beets seem to respond especially to cultivation n the arid regions, where they have given better results than any other crop. The arid section has been enabled to cope with other sections of the country where the crops have been produced by natural rainfall, not in the amount of tonnage per acre, but in the higher sugar contents and the purity of beet. The results in Utah have demonstrated the feasibility of the central plant idea, with branches scattered at numerous points for performing some detailed parts of the work.

HOW I MAKE PRIZE BUTTER.

I use good milk only, and I have a rather hard time getting it. The milk is heated in the receiving-vat to about seventy-five degrees and finished in the little tempering vat. When it reaches eighty-six degrees it is run through a separotor, skimming a thirty per cent cream. I use a starter and this, with the hand separator cream, brings the percentage of fat down to twenty-six or twenty-seven per cent, which I consider about right to secure that high, delicate flavor so well liked in our markets. My aim is to stir the cream every half hour, ripening at a temperature of from sixty-eight to seventy degrees, and as the degree of acidity advances the cream is gradually cooled down so that it stands at churning temperature at least six hours. The cream will show from sixty-two to sixty-four of one per cent of acidity with alkali tablets at the time of churning.

The cream is churned at from fifty-three to fifty-four degrees, and breaks in forty to forty-five minutes. The butter comes in granules the size of wheat grains. The buttermilk is drawn off immediately, and the butter washed in just enough water to float it. The churn is given a few revolutions with the engine at full speed. The water is drawn off directly, as I think it very essential to making a high-flavored product not to let it soak in water. The butter is well drained, put on the table-worker, salted with one ounce of fine salt

to the pound of butter, worked, and put in sixty-pound tubs, and is then ready for market.—John Metzer, Kansas.

Mr. Metzer starts with his proposition just where it must always start if fine butter is made. "I use good milk only." There is also great significance in the closing part of that sentence. Every patron of a creamery should read it over and think on it long. Here it is: "And I have a rather hard time getting it." That is the universal cry among creamery men and cheese makers everywhere. In Canada and Wisconsin and in New York it is just the same. Everywhere they say:

"The farmers are not particular enough to send us good milk. They don't seem to understand the value of good milk in making high-priced butter and cheese. They don't seem to realize the importance of clean cows, clean stables and clean milk cans. They demand that we shall make first-class butter and cheese out of milk that is made foul by the filthy habits of certain of the patrons. And there we stand. We simply cannot make such goods unless we have clean milk. If we ask the patrons to unite for the sake of their own profit, and force the dirty ones to reform their course or leave, they will not do it. They seem to act as if they had rather lose a good bit of money every year than to offend some of these dirty fellows who are lowering the value of the general product all the time."

The above is the burden of complaint that we have heard from thousands of butter and cheese makers for years, and it is still being uttered. The Wisconsin Dairy School is one of several in the nation that is turning out hundreds of bright, neat and capable young butter and cheese makers. But what can they do with dirty milk? What can they do with a patron who is naturally nasty in his habits and practices? The fact is, the patrons of every cheese factory and every creamery ought to form a solid body of sentiment and resistance against the dirty members of their own flock. It is these men who keep down the prices of butter and cheese.—*Hoard's Dairyman.*

ODDS AND ENDS.

THE DELINEATOR

The June Delineator covers many varied interests of the home. It shows the latest styles for Ladies, Misses, Girls and Little Folks, several pages being illustrated in colors so as to give a correct idea of color combinations. The ever practical dressmaking article describes the construction of the new Di Vernon waist. Summer time comes in for its share of attention by special articles being devoted to material for cycling skirts, to summer dress fabrics and to a number of new and pretty surf habits or bathing stits. Summer Millinery is also illustrated in colors. The problems of Moving Day and after are dealt with very thoroughly by Margaret Hall and the etiquette required on the part of those who have moved into a new neighborhood is indicated by Mrs. Frank Learned in her Social Observances Department. Pastimes for Children, all sorts of fancy needlework for summer hours, indoor decorations and other varied interests coms in for attention. The wonderful benefactions of Baroness Clara De Hirsch, who aided her husband in giving away $100,000,000, are described and illustrated by Sara K. Bolton. The short stories of the minth are by Elmore Elliott Peake and William McLeod Raine. A collection of antique silver is described in a special article devoted to the subject by N. Hudson Moore. The illustrated Cookery deals with birthday parties and is very beautiful.

There is much else of interest in The Delineator; a publication that safely claims for itself that there is no magazine published that can meet the needs of all women at so many points

SCRIBNER'S.

Henry Norman, M. P. resumes his article in the June Scribner's. The origin and traditions of the Scotch universities are little known in this country, and will be described by Prof. John Grier Hibben, of Princeton, who visited them a year ago. Mrs. Kate Douglas Wiggin's amusing seriel, "The Diary of a Goose Girl," is continued. Ernest Seth-Thompson will begin another of his animal biographies the hero this time being a mountain sheep known as "Krag the Kootenay Ram." Walter A. Wyckoff, the author of "The Workers," onced worked on the Union Pacific Railroad as a section hand, and he will deseribe the incidents of that experience.

MCCLURE'S.

Mrs. Elizabeth Stuart Phelps's drama "Within the Gates," begun in McClure, s Magazine for May, is continued in the June number. Josiah Flynt contributes a new "World of Graft" article called "Boston, a Plain-Clothes Man's Town." In "The King's Gold," Robert Barr relates more of the incognito rambles of King James V. of Scotland, in the highways and byways of his Capital. An article by that clever essayist, E. S. Martin, entitled "Women" which is handsomely embellished with numerous half-tone engravings from celebrated portraits of beautiful women of former times. The author of "The Women and her Bonds" Mr. Lefevre, contributes another Wall Street story. An exceedingly important discovery, is made public for the first time in an article called "Geology and the Deluge," by Prof. Fredrick G. Wright, of Oberlin College.

THE GENTLE FILIPINO.

I have chases the fierce Apache
Through his God-forsaken land:
I have tracked the daring horse-thief
Where his footprints marked the sand;

I have summered with the robbers
Down at Conep-by-the-Sea,
But the gentle Filipino—say,
He beats them all for me.

He beats them all for me, my son,
The whole immortal lot,
In his slushy, mushy country,
Where the climate's good and hot.

I have tracked the red and yellow,
And I've tracked the wild and tan
But the gentle Filipino is
The high, low, jack and game.

With his timid little manner
And his sweet and loving smile;
And his easy way of swearing that
He loves you all the while.

With a white flag on his shanty
Hanging out to catch the eye,
And his little rifle ready
To plunk you by-and-by—

For to plunk you by-and-by, my boy.
To shoot you in the back,
And to slip away as swiftly as
A sprinter down the track,

To come around when they plant
Just to drop a little tear.
For the gentle Filipino is
A tender-hearted dear.

He's as gentle as a kitten,
And his pastime, as a rule,
Is to shoot the flag-of-truce man
As a sort of April fool.

And if he can find a tree-top
To climb to with his gnn,
And pick off the lad that's wounded–
Then he knows he's having fun;

He knows he's having fun, boys,
A grand, good time all 'round—
They look so awkward tumbling
From the stretchers to the ground.

And it is such fun to shoot them
And kill them where they lay,
For the gentle Filipino loves
His sweet and childish play.

And I know I am a blacksmith,
'Cause the pamphlets says I am;
But I think I'll keep a fighting
Just the same for Uncle Sam—

Just the same for Uncle Sam, boys
And just bear this in mind:
And that the watch-dog's better than
The cur that sneaks behind.

And I'll try to bear up somehow
Under this my murd'rous taint,
For the gentle Filipino
Is a darned queer kind of saint.

JOSEPH L. AGNELL.

Company E. Fourth United States Infantry.
Manila, P. I., March 19, 1901,

A WOMAN'S WORK.

When breakfast things are cleared away
The same old problem's rising,
For she again sits down to think
Of something appetizing.
The dinner she must soon prepare,
Or give the cook directions,
And great is the relief she feels
When she has made selections.

When dinner things are cleared away
The problem that is upper
Is just the same with one word changed—
"What can I get for supper?"
She wants to give them something new,
And long is meditation,
Till choice is made, and then begins
The work of preparation.

That "woman's work is never done"
Has often been disputed,
But that she's worried is a fact
And cannot be refuted.
The worry over what to eat
Is greatest of these questions,
And glad she'd be if someone else
Would make the meal "suggestions."

—*Pittsburg Dispatch.*

COLORADO BEN.

Ben Davis was a handsome youth, but dry as any chip,
For Nature gave him gaudy clothes, but let the flavor slip;
And underneath his gaudy clothes he wore a pumpkin heart,
A painted turnip, dry as bran, he went into the mart—
A hypocrite—a Pharisee—a fraud in royal guise,
Without a single drop of juice—a liar of great size.
And those who bit his bloodless flesh were prompt with gibe and curse.
They came with solid chunks of prose—the poets threw their verse.
Ben Davis heard their stinging words, they rankled in his mind,
They cut him to his mealy heart; they forced him on to find
Some place where better quality might grow beneath his vest;
He followed Greeley's old advice, and took himself "out West."
On Colorado's sunny plains, where clouds are seldom seen,
Beside an irrigating ditch, he donned his coat of green.
The blood grew warmer in his cheek, and, in the warm sunshine
Of mounrain air, his flesh absorbed the flavor of the vine.
Ben Davis! Colorado Ben—apoligies are due
From one who has, in former days, hurled ragged verse at you!
Wise hogs would hardly eat you for the second time back East,
But, from Westward ho! with Baldwin you are reckoned not the least.
You "grew up with the country" where are mellow fruits—and men.
Now go up head! Good luck, old boy, oh, Colorado Ben!

—*R. N. Yorker.*

THE OLD HOME IS SOLD.

"We sold the dear old home to-day,"
The old folks wrote me, far away;
The house, the garden and the lands,
All now belong to strangers' hands.
The orchard father pruned with care,
Will luscious fruit for others bear.
The rose that grew near mother's door,
Will bloom for her, ah! nevermore.

O, I had hoped the time might come
When I, once more could see my home;
Could tread again those paths of yore,
That lead down by the river's shore.
I look back through the past and see
A picture dear to memory.
A home of joy with father and mother
An unbroken band were we together.

Years rolled on, and we drifted apart,
Out into the world to make a start.
Sad partings came, and one by one

We went away and left them alone.
Yes, all alone were the old folks left
In a saddened home, of joys bereft.
Lonely they toiled together each day—
But the home is sold, they're going away.

Their forms are bent with age and care,
Furrowed their cheeks, silvered their hair.
Like a storm-tossed ship they drift with the tide,
Almost in reach of the other side.
Father of mercy, we ask of Thee,
Pilot them gently o'er life's rough sea;
And, when their stormy voyage is o'er,
Anchor them safe on the other shore.

And now, old home, we say to you
A long farewell, a fond adieu.
Thy walls will echo never more
The songs we sang beloved of yore.
No more from distant parts of earth,
We'll meet again around thy hearth.
No more within thy sacred shrine,
Join in the tune of "Auld Lang Syne."

—Written for Green's Fruit Grower by Mrs D. C. Weltner.

PAN-AMERICAN EXPOSITION — WOMANS BUILDING

THE IRRIGATION AGE.

VOL. XV. CHICAGO, JUNE, 1901. NO. 9

Extensive Irrigation Works.

In no country in the world has agriculture ever attained to the comparative dignity found in Peru by the Spanish conquerors. Agriculture is admitted to be the backbone of the United States, and statesmen and politicians, especially at election times, manifest great friendliness and affection for the farmers; but the ancient Peruvians, nobles and plebians alike, were all actual tillers of the soil. The Inca himself did not disdain to set the example, and each season on a certain day, attended by his court, the monarch turned up the fresh earth with a golden plow.

Ancient Peru included a large part of Chili, and husbandry was pursued by the Indians on principles truly scientific. Agriculture was the basis of the political institutions; and remarkable provisions existed for the distribution of the land in equal shares among the people. Government assistance rendered productive every acre of available land. Much of the country was arid, and to reclaim this the Incas constructed reservoirs and canals on a magnificent scale. Prescott, in his "Conquest of Peru," describes irrigation works of splendid proportions and fine efficiency. Some of the canals were of great length, carrying water to the coast valleys from mountain reservoirs hundreds of miles distant. He mentions one canal in particular as nearly five hundred miles long. The building of these long aqueducts called for some remarkable engineering, the results of which in many places are plainly visible today.

These works of the Incas, however, were destroyed or suffered to decay by the Spaniards, whose desire was only for gold. Nevertheless, there yet remain a few sections under the ancient irrigation. A recent consular report describes several valleys teeming with tropical luxuriance, situated between parching deserts, irrigated by water flowing through the old watercourses of the Incas, but coming from unknown distances.

Under the ancient order, the greatest care was exercised that every occupant of the land should receive his share of water. The quantity allotted to each tract of land was prescribed by law, and royal overseers superintended the distribution and saw that it was faithfully applied. There was no waste and there was no speculation in water nor over-appropriation, and there was no conflict of water rights. Although the Peruvians probably did not enjoy some of the privileges of the irrigators of the United States, they also doubtless escaped many of the vexations.

Waste of Water.

Several of the Western papers have sounded the note of warning in the matter of the waste of artesian water supply. Flowing or artesian well all receive their supplies from vast underground reservoirs, the same reservoir supplying many wells. During the past two years thousands of new wells have been bored, tapping these underground reservoirs, and complaint is now made that wells are allowed to flow on even at times when no use is made of the water.

The result is that the underground reservoirs are becoming diminished in volume, and wells which flowed freely a few years ago have now no water. The good advice is given that legislatures enact laws

requiring owners to cap their wells when the water is not actually needed for a useful purpose.

What It Would Do There is more of truth than fiction, more of practicality than poetry in the representations of Mr. George H. Maxwell, Executive Chairman of the National Irrigation Association when he says:

"It would accomplish the colonization of the West and the creation of a great market for manufacturing: it would result in the employment of labor, the development of mining, in assistance to navigation, the prevention of floods, and in relief for the congested condition of our cities in supplying material for thousands of rural homes.

The great stimulation of business and production incident to the coionization of the Middle West, where men went out and took up from 160 to 640 acres each, and made homes for themselves, would be small compared with what would occur if 100,000,000 acres of arid land, which would be inexhaustibly fertile, were given water and divided into 10 to 40-acre highly cultivated farms."

Eastern Leaders Less Arrogant. The defeat of the great River and Harbor Bill, carrying its $50,000,000 of appropriation, has caused no little bitterness of spirit among those who had favored the resulting improvements to the various rivers, creeks, and harbors included in the bill.

The suggestion has been made that Eastern men who have been favorably disposed to the irrigation measures proposed for the West will be alienated therefrom by this method, which has been denounced as a dog-in-the-manger policy on the part of Senator Carter, who held the floor of the Senate for the last twelve hours of its session, and thus prevented the passage of the bill, because, they say, the House refused to allow the irrigation amendments. Senator Carter expressly stated that he undertook the defeat of the measure without any motive of revenge, but because he believed it to be his patriotic duty to work his utmost to prevent such wasteful and extravagant expenditures, and to draw the line against such abuse as had crept into a policy of national improvement.

That the River and Harbor Bills, which have come to be generally known as "Government pork bills," have grown to be outrageous extravagances, is well recognized, and it is probable that the defeat of this measure will be a warning to Congress to in future eleminate these ridiculous so-called national aids to navigation where a channel to be improved starts with only six inches of water (as was the case in one instance in the defeated bill), and to frame the bills on the lines of improvement to the great harbors and waterways which really affect the whole United States, and at the same time to recognize the sentiment of the country, which demands that the great arid area of the West, lying like a vast fortune in trust, shall be developed and made to contribute its share to the nationa wealth.

Mostly Government Land. In connection with the much-discussed proposition for th Government to provide storage reservoirs for irrigation in the West, it is interesting to note the large proportion of public land yet remaining in some of the Western States and Territories. In Arizona, 76 per cent, of the land belongs to the General Government; of California, with all its great private developement, 58 per cent. is public land; of Montana. 78 per cent. remains public, in Utah, 89 per cent. belongs to the United States: in Wyoming, 86 per cent; in Idaho, 89 per cent., and in Nevada 95 per cent. belongs to the Federal Government.

With title to all this vast acreage yet remaining in the General Government, it would seem to be the part of wisdom for that Government, to provide the means for its improvement and settlement.

Differs from the American Way. "The forestry and irrigation problems in almost all the countries of the old world are solved by the respective governments. The comparatively small country of Sweden," says *National Irrigation*, "owns nearly 20,0 00,000 acres of forest lands, the income from which maintains numerous forestry schools

besides yielding a handsome revenue to the State. Germany and France both have extensive forestry departments, and Spain controls all irrigation works. The general government is always the logical manager of both classes of such work, for successful irrigation development depends not only upon proper supervision, but likewise upon a comprehensive forestry system which will protect this important source of irrigation supply."

Machinery for Irrigating. The adoption of pefroleum as a fuel by some of the western railroads and the discoveries of the vast California oil deposits direct special attention to this question of fuel in the western States where coal is such an expensive commodity. It would seem that the California and Texas oil fields may supply the West with motive power, and the discovery of oil is hastening the adoption of oil-using engines.

In many of the smaller irrigation systems power is employed extensively in getting the water to the land. Where coal and wood are expensive it is often advan, tageous to use engines operated by gosoline-distillate, kerosene, or crude oil.

A recent visit to the large Chicago warehouses of Fairbanks, Morse & Co., showed a great number of types of engines and pumping machinery used in irrigating—petroleum engines, and those using gasoline, kerosene and distillate, steam engines, boilers, windmills, etc.

"If a considerable quantity of water is desired, but it is necessary to raise it only a short distance," explained the sales-manager, "then a centrifugal pump would be a desirable type. If, however, water is to be taken from a greater depth than would be available for an ordinary suction pump, a good machine would be a combined engine with gear and box forming a part of the engine, the base being extended and arranged to carry the gearing. A special form of clutch is used for disengaging the gear to facilitate starting, or so that the engine may be used for other service without disconnecting the pump.

"Another interesting method of pumping from a well is seen in the work of a combined engine and air-compressor. The water is literally blown out by the air forced into the well. A pipe is placed within the well casing and as the air is forced into that pipe the water is forced out in a continuous stream.

"This particular engine," remarked the manager, pointing to a modest-looking machine, "will pump out 42,000 gallons per hour.

"The development of pumping machinery in the United States within the last few years has been remarkable. We have reached a high degree of perfection in this as well as most other classes of machinery, and American pumps and engines easily lead the world."

Money for Irrigation. The creation of an arid land reclaimation fund, from the proceeds through the sale of western public lands, to be used in the construction of irrigation works, is a proposition which will commend itself to every interest. The people of the West should, of course, support it to a man, while there can certainly be no opposition from Eastern Congressmen.

Irrigation and Immigration When the President said in New Mexico that irrigation meant immigration he struck a responsive chord in the breasts of Western people. We have paid out an enormous sum for our outside expansion the past three years, and shall have to pay out more yet. We have borne the burdens of expansion with scarcely a knowledge that a burden existed. To provide for home expansion by irrigation of the arid lands of the West would entail no burden whatever. The sum required would scarcely make an appreciable difference in the annual expenses of the Government.

For years we have been appropriating vast sums of money upon the theory that the improvement of rivers and harbors is a natural and proper task for the Government. There is just as much reason for the Government to render habitable and productive its millions of acres of waste land. We are dyking the Mississippi, and millions of dollars have been expended to keep that wayward stream within its nat-

ural channel. To be sure this has been and is being done on the theory that it is necessary for the improvement of navigation, yet every intelligent citizen knows that the real object sought is the protection of the adjacent lands from overflow. The *Mercury* recognizes this as a perfectly proper object of Government expenditure, as it does also its kindred work of making productive the waste lands of the West. It also recognizes the fact that in a measure both objects might be secured by a new plan of operation, that of building immense impounding reservoirs at the headwaters of the Mississippi and other streams whose floods do annual damage to the lands along their banks. Improvement of rivers and harbors and irrigation of waste lands are indeed kindred matters, and should be treated as being upon exactly the same footing with the general Government, and in a large measure both might be secured by the same outlay of money. The West will make itself felt in Congress on this subject until its position in the matter has been recognized as the correct one and this neceseary work has been taken up by the Government.—*San Jose Mercury.*

IRRIGATION IN HAWAII.

BY WALTER MAXWELL, PH. D., in Bulliton 90, Department of Agriculture.

The precipitation of atmospheric moisture is very uneven and irregular over the surface of the earth. There are zones that are marked by annual deluges, and there are vast areas upon which rain rarely falls. These rainless areas are not confined to conditions peculiar to specific latitudes, but are found in the tropical regions of India and Africa, over the wide plateaus of North America, and in other localities having widely varying climatic conditions.

The regions of small rainfall are very generally distinguished by lands of great natural fertility. This is due largely, on the one hand to the absence of great rains that leach out the elements that feed plants, and on the other hand, to the relative absence of crops, which results from lack of rain. Among the most productive tracts upon the earth to-day are regions that were naturally arid, but which have been rendered productive by irrigation. These tracts include the Punjab and other vast districts of India, the great basin of the Nile in Africa, and large semiarid areas that have more recently been brought under cultivation in the middle and western United States.

The failure of the natural rainfall to produce crops may be due to the insufficiency of the total precipitation, as in regions in India, Africa, and other lands, where it does not aggregate 10 inches per year; or it may be due to the seasonal distribution, as in other parts of India and Africa, in northern Queensland, and some of the Pacific islands, where a heavy and almost the whole precipitate, takes place within two or three months. In speaking of the agriculture in parts of the Himalayas; Mr. Buckley says: "Where the rainfall varies from 50 to as many as 100 inches in the year, crops grown on the terraces in the mountains are matured in the dry season by artificial irrigation." In some localities in northern Queensland the annual rainfall reaches and exceeds 100 inches, yet the sugar-cane crop has to linger through an annual arid period which greatly reduces the yield, while upon the Pacific islands of Hawaii, despite the winter rains, many of the most fertile lands would be useless without the prevailing practice of irrigation. Irrigation, consequently, is playing an increasingly important part in modern intensive agriculture

The history of irrigation covers methods of applying water to crops, inclucing the crudest efforts of the peasant and the great sys

tems executed by governments or corporations, such as are in operation in India, the United States, and in the valley of the Nile. Certain of those systems are vast, and have been instituted under the pressure of meeting great emergencies. To-day India is using irrigation upon a stupendous scale in grappling with the calamity of famine.

Economic irrigation requires the consideration of physical laws which were unknown to the authors of primitive methods, and which have not been generally observed in establishing the huge system of irrigation already mentioned. Some of the physical laws which underlie any rational practice in the application of water to crops are briefly considered in the following paper.

EVAPORATION OF MOISTURE FROM WATER SURFACES AND SOILS.

The movement of moisture is constantly going on, The simplest evidence of this movement is seen in rainfall and in the evaporation from water and soil surfaces.

The factors that have been given the greatest prominence as exercising a controlling action upon evaporation from soil and from the surface of water are the temperature and the relative humidity of the air. This view is amply sustained if the examination is confined to the action of these factors during the extreme season of the year There is no question concerning the greater evaporation of moisture from soils and waters during the months of summer, when temperatures are high and the amount of atmospheric moisture is also relatively smaller than during the cold season, when the temperature is lower and the humidity of the air greater. This is demonstrated in many localities by the excess of water that accumulates within and upon the soil in winter and the droughts that obtain in the summer. There are localities and regions, however, that are so fortunate as to have the greatest rainfall during the season of greatest evaporation and consequently the greatest plant growth. Setting aside the differences concurrent with the seasons and confining observations to the relative actions of the several factors during the summer, it is then found that the temperature of the air and the amount of moisture that it contains are not the most dominant factors in the control of evaporation. As already said, they are factors, but their combined effects do not compare with the effects of wind. Not only in the matter of irrigation, but also in the location and exposnre of reservoirs this fact is of leading importance. In view of this the writter carried out a series of evaporation determinations by means of evaporators, at the same time keeping a record of the temperature and relative humidity of the air. These observations were made as a part of a study of the factors that control the rational irrigation of the sugar-cane on the Hawaiian Islands. The form of evaporator used was small agalvanized iron pan,

1½ inches deep and having a superficial area of 120 square inches. The evaporator was placed under the covored stand where the meteorological instruments were located and between the dry and wet bulb thermometers, thus having the same protection from the sun and the same exposure to the wind as those instruments. At 7 o'clock on the morning of the first day 500 grams of water were weighed into the evaporator, and at the end of each twenty-four hours the weight was taken and recorded and the volume made up again to 500 grams. These observations were made daily throughout the year. A second evaporator similar to the first was placed in a barn 30 feet distant from the other. The large doors of the barn were kept open day and night to allow of air circulation, but any violent air movement was rigidly guarded against. The purpose was to secure the same conditions of the temperature and humidity of the air as those surrounding the evaporator placed outdoors, but to eliminate the factor of wind. The data furnished by the two evaporators were taken and recorded in the same manner and with the corresponding readings of thermometers. The results of these observations covering a period of two hundred and seventy days, reduced to monthly averages, are given in the following table:

RELATIVE EVAPORATION FROM WATER SURFACE EXPOSED TO THE WIND AND PROTECTED FROM THE WIND.

Month.	Exposed to the wind			Protected from the wind.		
	Temperature of air.	Humidity of air	Evaporation.	Temperature of air.	Humidity of air	Evaporation.
	°F.	Per cent.	Per cent.	°F.	Per cent.	Per cent.
April	74 4	77 4	28 5	78 7	77 4	11 7
May	76 0	80 2	27 2	80 3	80 2	11 3
June	77 0	83 6	22 5	81 3	83 6	10 1
July	78 3	77 3	25 8	83 0	77 3	12 1
August	78 7	73 8	30 0	82 4	73 8	12 5
September	76 8	80 4	24 3	80 6	80 4	10 0
October	75 3	80 1	23 5	78 8	80 1	9 2
November	71 0	83 2	23 3	74 1	83 2	9 4
Average	75 9	79 5	25 6	79 9	76 5	10 8

A relation may be noted between the temperature and humidity of the air and the amounts of water evaporated, but the important fact revealed by the table is the contant and great difference in the amount of water evaporated from two pans. The total amounts of water lost during the eight months by the exposed and protected evaporators were, respectively, 33,480 grams and 14,175 grams.

The outdoor evaporator lost 136 per cent more water that the indoor evaporator. The vast difference is wholly due to the action of the wind, to which the former was exposed, and it occurred in spite of the fact that the indoor temperature was uniformly 4 degrees higher than the outdoor temperature.

The differences in the amounts of water given off by the outdoor evaporator on different days bear some relation of the differences in the temperature and humidity of the air. They are too great, however, to be accounted for by those factors alone; they were, in fact, largely due to different velocities of the wind. By way of improving this, we make use of the data recorded during the month of November. During the first ten days of that month the average daily evaporation, under the constant action of the northeast trade wind, was 33.7 per cent. During the following eight days, when the wind direction was south and the air was almost still, the average evaporation was only 13.2 per cent. During these eighteen days the maximum evaporation under a very high wind reached 41.2 per cent, while upon another day, no motion of the air being observed, the evaporation was only 8.1 per cent. In the course of these twenty day the temperature variations were very small.

From the determinations that have been recorded it may be seen that the monument of the air is the paramount factor in controlling the rate of evaporation from water and soil surfaces. Soil whose surfaces are exposed to the actions of strong driving winds will give up more moisture, and will therefore need more water, than areas in sheltered locations. Water surfaces exposed to the sweep of the wind lose heavily by evaporation. Economy of water therefore dictates that reservoirs be built so as to have the greatest depth and the least surface, and that they be located so as to be sheltered from the direct action of pervailing strong winds.

TRANSPIRATION OF MOIRTURE BY VEGETATION.

The volume of water evaporated from the soil and the volume transpired by the plant during its growth are the controlling factors in determining the total water required in the production of a crop, and therefore the quantity of water to be supplied by irrigation.

Water enters very largely into the structure of all living organisms. It is not only the agent which makes possible the mobility of other constituents of the plant, conveying them from one location to another, but it enters in large proportion into the structure of the organism itself. Consequently plants and trees at all times hold a great volume of water, the supply of which is constantly replenished by the water taken up by the roots and as constantly depleted by the moisture given off into the air by means of transpirtation. It is these quantities that we require to know something definite about.

The waters of the Hawaiian Islands are of excellent quality, if they do not come in contact with the sea inflow or with soils having high contents of salt, due to the overflow of the sea at some earlier period. In some localities, however, contamination by sea water has

gone so far that the water is destructive to vegetable life. In most instances the deleterious agent is common salt; in others there is a mixture of common salt with chlorids of magnesium and calcium. The latter are most injurious to plant life and, in lowlands, lying almost level with the sea, where there are no means of getting these salts removed, their impregnation renders the soil useless.

A considerable portion of the water supyly for irrigatron in the Hawaiian Islands is derived from the underground flow. Ground waters, on account of the considerable proportions of certain highly desirable elements they contain, may be very valuable for application to crops. On the other hand, because of the large amount of substances inimical to plant life held in solution in some cases, they may be quite unfit for irrigation. Numerous instances of the unfitness of such waters for plant use are furnished by other countries, and special examples have been found by the writer upon the Hawaiian Islands.

DUTY OF WATER.

By the term "duty of water," as used in this bulletin, is understood the volume of water that is required to mature a given crop in given conditions of soil and climate. That the duty of water can not be a definite factor, the water being in equal demand and rendering the same service in all locations, has been amply indicated by the facts stated in preceding paragraphs It has been shown that there are locations where the volume of water directly evaporated from the soil is double the amount removed in other locations and under totally different conditions of climatic exposure and action. Further, it was shown that soils themselves vary extremely in their powers to take up and retain moisture, which affords another illustration of the factors that determine the service of applied water in relation to the crop. If a given volume of water is applied to a soil of low absorptive capacity and with a small retentive power, loss occurs by seepage on the one hand and by extreme evaporation on the other, thus causing a large expenditure by the soil and a minimized service rendered to the crop. Again, crops may vary between very wide extremes in the volume of water they consume per unit of substance formed, and consequently in the volumes necessary to bring them to maturity.

IRRIGATION PRACTICE ON THE HAWAIIAN ISLANDS.

The chief crops that are grown by the aid of artificial irrigation in Hawaii are rice and sugar cane.

The lands used for rice are the lowest flats found at the outlets of valleys and close on the sea. Irrigation is practiced upon all these lands, but no means of determining the volume used per acre have been adopted, and data are not at hand bearing on the question.

Sugar production is, relatively speaking, a recent matter so far as

the present volume of production is concerned. So late even as 1880 the output is recorded as being 30,000 tons, while the production in 1889 was 282,807 tons. The part played by artificial irrigation it the production of the Hawaiian crop is seen from the following statement:

	Tons.
Sugar grown by natural rainfall	116,382
Sugar grown by irrigation	166,425

The area to which water is artifically applied is yearly increasing, and in two years more than two-thirds of the crop, which is also vastly increasing, will be grown by aid of irrigation.

The richest lands upon the islands are those lying toward and a little above sea level. In most of the districts, however, the rainfall over the low-lying lands, and especially upon the leeward side, is utterly insufficient to produce the sugar crop. Until the practice of irrigation was adopted these lowlands were useless, but now they are, beyond comparison, the richest and most productive.

The primary source of water upon the Hawaiian Islands is rainfall, Two unfavorable conditions attend its precipitation: (1) The maximum quantity falls during the cool season, when the crops are not in a state of maximum growth and able to make use of it, and (2) the chief precipitation is over the mountain areas, where the water falls, soaks down into the rock strata, and runs largely to the sea, unless arrested and returned to the land. An illustration of the variation of rainfall with altitude is afforded by the following table:

VARIATION OF RAINFALL WITH ELEVATION.

	Rainfall at sea level	Rainfall at elevations of 2,000-3,000 feet (2½ miles from sea).
	Inches.	Inches.
Honolulu (Oahu)	32	118
Hana (Maui)	28	179

The apparently disadvantageous circumstance of heavy precipitation at maximum elevations has been turned into a special advantage by engineering means. In certain districts the water is collected by small ditches over the mountain areas, where it falls, and is conducted by main ditches or by the flumes down to the cane-bearing lands below, over which it is distributed by gravity. Where the rainfall can not be easily collected over the mountain areas, the water which sinks down into deep substrata is tapped and arrested at or near sea level, where it is found running toward the sea. In places where the lava rock strata run out before reaching the sea the water comes to the

surface in springs, but the great body flows out or is held in underground reservoirs at varying depths, and has to be sought for by means of wells, from which the water is lifted and forced up to considerable elevations by high- duty pumps, where it is distributed.

The pumps that are in service on the islands are chiefly of American build, and are in some instances of large capacity. Their duties range from the small lifts of the centrifugal pumps to those raising 12,000,000 gallons per 24 hours.

The amount of water applied in the irrigation of Hawaiian sugar cane is controlled mainly by the volume of the supply. Concerning the volume that is considered necessary and that is taken as a basis of estimation in calculating the water required by any given plantation and the capacity of the pumps necessary to lift and apply it, reference is had to the data contained in a report on investigations made in 1889 by Messrs. J. D. Schuyler and G. F. Allaidt, civil engineers. The data and the views contained in that report were made the basis of operations by the authorities quoted, and they are still the views and represent the practice of those men who were on plantation at the time of the publication of the report in 1889. Other views and other methods are now coming into practice which are based more largely upon the principals set forth in the earlier paragraphs of this report and upon results obtained in actual experiments in irrigation. These will be spoken of later. The report referred to says:

> It seems to be the general practice here [island of Oahu] to irrigate "plant' cane every three or four days for the first month after planting or unttl it has made a strong growth of root and stalk. After that a watering is given every seven days for a time, diminishing to one watering every ten days, which is continued for about fifteen months from the time of planting, or until the maturity of the cane. It is customery to eease irrigation from one to three months before cutting. If, as in some districts, the cane did not mature short of eighteen to twenty months from time of planting, the period of irrigation would be from fifteen to eighteen months. In making our estimate we have assumed that fifteen months of irrigation would be the average required for sugar cane on the leeward slopes of this island [Oahu]. Three waterings per month is the least that is considered safe to apply to keep the cane growing without check. In localities corresponding in position and climate to Honouluili it is customary to maintain this periodical irrigation regardless of the rainfall. The rain may at times exceed the quantity applied artificially, but irrigation is performed as usual notwithstanding, in order that there shall be no break in the waterings. It seems to be generally understood by all planters that the depth of each watering shall be at least an average of 3 to 4 inches over the whole surface. Where the intervals between waterings are ten days and the depth applied is 4 inches, 1 cubic foot of water per second will perform a duty of 59.5 acres. With intervals of seven days and the same depth applied, 1 cubic foot per second would irrigate but 41.6 acres, or 55.5 acres if the depth applied is but 3 inches.

At this place it may be convenient to state, for the use of persons who judge by the standard of rainfall, that 1 cubic foot of water per second is equal to a flow of 294,700,032 United States gallons in fifteen months, and that if this volume were applied to 41,6 acres that would

be equal to 7,108,173 gallons per acre, or a rainfall of 210 inches per year and 262 inches to mature the crop.

The report proceeds to give examples, and begins with the Hawaian Commercial Company's plantation at Spreckelsville, island of Maui, of which it says:

> The record for the calender year 1888 shows that there was delivered to the plantation the following quantity of water:
>
> | | Cubic feet. |
> |---|---|
> | From the Haiku ditch | 1,175,000,000 |
> | From the Waihee ditch | 919,000,000 |
> | | 2,094,000,000 |
>
> Or 15,700,000,000 gallons. The rainfall during this period was 19.08 inches.
>
> With this water there were irrigated 2,000 acres of "plant cane" and 600 acres of "ratoons" (volunteer second crop). In addition, 400 acres of seed cane were irrigated once a month, consuming a quantity roughly estimated at 70,000,000 cubic feet. The remaining 2,024,000,000 cubic feet would be equivalent to a constant average flow through the year of 64.18 cubic feet per second, which, divided into 2,600 acres, would appear to give an average duty of 40.5 acres per cubic foot per second, and to indicate that the mean depth applied was nearly 18 feet in the aggregate (22 feet, or 264 inches, for the crop period of fifteen months).

The report states that the explanation for "this seemingly low duty" may be found in the fact that the water was also used for cattle, domestic, and other purposes.

Mr. Hugh Morrison, general manager of the plantation at Spreckelsville, states, as an epitome of his experience, that 11,000 cubic feet per acre applied every seven days will produce the very best results in growing sugar cane. Covering the period of fifteen months already stated, that amount was equal to 5,348,200 gallons per acre, or a rainfall of 197 inches, which with the 19.08 inches of actual rainfall makes a total of 216.08 inches to produce the crop. The report continues:

> Mr. Morrison further adds that it is almost impossible to put on too much water of course within reasonable limits), and that the more water is applied, without going to extremes, the greater the yield He has obtained a yield as high as 10 tons of sugar per acre in localities sheltered from the wind. The average yield of 1888 on 2,000 acres of plant cane was 5¾ tons of sugar per acre; the raroon crop averaged 3⅜ tons per acre. * * *
>
> On the Wailuku plantation, island of Maui, where the water supply is very abundant and in excess of the needs of the plantation, the consumption is equal to a duty of about 50 acres per cubic foot per second on plant cane and 60 acres on ratoons.
>
> On the Hamakuapoko plantation, Maui, where the average annual rainfall is reported as 36.2 inches, the amount applied is stated by the superintendent, Mr. James Cowan, to be 10,890 cubic feet per acre to each watering. The intervals between waterings are seven days, and consequently the duty of water in continuous flow is 55.5 acres per cubic foot per second.

This amount is equal to a depth of 195 inches, which, with the natural fall of 35.2 inches of rain, is equivaient to a total rainfall of 230.2 inches to mature the crop, or 184.2 inches per annum. Continuing, the report says:

In making up these figures, however, Mr. Cowan qualified them by saying that hey are for the full capacity of the ditch, which is not always full when required, and is only partially compensated for full flow by the rainfall. * * * The average yield of the plantation is given at 5.6 tons of sugar per acre for plant cane and 4 tons for ratoon crop. * * * He summarizes by stating that to raise 1 pound of sugar requires about 51.8 cubic feet of water.

There are so many elements of uncertainty included within the foregoing statement that it must be considered as merely an approximation to the truth. The report further states:

On the Kekaha plantation, Kauai, water is obtained by pumping to a height of 18 to 36 feet, en average of about 27 feet. The delivery of the water is contracted for at the rate of $35 per acre per unnum. The contractor is required to deliver sufficient water to irrigate 700 acres every ten days to an average depth of 4 inches at each watering. The duty thus performed, presuming the quantity contracted for is fully delivered, would be 59½ acres per cubic foot per second. The pumping is done during ten hours each day. The three pumps required to have a capacity of 7,000,000 gallons per day each. Coal costs $14 per ton at the pumps. A very unusual yield is reported from this plantation. Ratoon crops for seven consecutive years are said to have produced an average of 5 tons of sugar per acre each year.

In summing up their observations, Messrs. Schuyler and Allardt say that a greater duty than 60 acres per cubic foot per second can not possibly be considered safe; or in other words, at least 5,000,000 gallons per acre are required to make the crop.

The data and conclusions furnished by Schuyler and Allardt have been given at length, for the reason that they formed the basis of computations some ten years ago and are still followed by the older plantation authorities. During the past six months two persons who are connected with the opening up of new plantations assured the writer that those estimates "were not conservative enough to be safe, and that in their calculations and provisions they were providing for not less than 6,000,000 gallons of water per acre for the crop. The more conservative estimates of those gentlemen are not based upon any ascertained knowledge of the requirements of the soil and crop. They are merely the result of a wish to be safe. As a consequence, when the basis of 6,000,000 gallons per acre for the crop becomes the practice, some other gentlemen of conservative mind who also wish to be safe will appear who will think 7,000,000 gallons a necessary provision. At present the practice upon the plantations is not resting upon ascertained requirements which can be arrived at only by the aid of a knowledge of the physical laws that have been set forth and by actual tests involving the determination of the amount of water that the crop during the different stages of growth requires in given conditions of soil and climate.

STUDY OF IRRIGATION AT THE HAWAIIAN EXPERIMENT STATION.

In view of the absence of established data bearing upon the actual requirement of the sugar cane in the conditions of soil and climate of the Hawaiian Islands, and also on account of the great variations that

obtain in the practice of irrigation, the writer determined upon a series of tests which should be carried out along lines of strictly economic purpose, but controlled by the aid of such physical and chemical observations as were previously shown to underlie any system of rational irrigation

The Hawaiian Experiment Station is located in the suburbs of Honolulu and comprises five acres of land. In laying out the area into divisions and plats special provisions was made for the use of irrigation water. The water supply is that of the city municipality, and it is laid on by iron pipes with very numerous faucet discharges. The distribution is made by means of rubber hose, thus controlling the delivery at any place or time.

The topography of the field is favorable for irrigation; its surface being relative level.

The soil is exclusively derived from the decomposition of basaltic lavas. There is a depth of 15 inches of tillable earth resting upon a porous subsoil- an understratum which is composed of chips of lava stone, scoria, and black sand. The total mass of soil is thus relatively small, 1 acre to the depth of 15 inches weighing 4,368,825 pounds. The constituents of the soil are shown in the following table:

ANALYSIS OF SOILS AT HAWAIIAN EXPERIMENT STATION.

Soil constitutents	Amounts present	Soil constituents.	Amounts present
	Per cent.		Per cent
Moisture	9 526	Ferrous oxid	5 515
Combustible matter	9 347	Alumina	12 540
Insoluble silica	15 660	Manganese oxid	145
Soluble silica	17 058	Lime	861
Titonic acid (TiO)	2 460	Magnesia	821
Phosphoric acid	1 050	Soda	175
Sulphuric acid	164	Potash	581
Carbonic diocid	080	Nitrogen	149
Chlorin	Trace.		
Ferric oxid	23 630	Total	99 86

Continued.

IRRIGATION IN CONGRESS.

If the leading minds of the country were asked to seriously discuss the topic: "What is the greatest question in the United States awaiting solution?" it is probable that a very few men living east of the Mississippi would think of "national irrigation" in this connection. To most of such the subject is new and unstudied. It will bear study; it will bear the most searching scrutiny, and the more studied the more it is seen to be a question of exceptional breadth and of truly great possibilities and far-reaching importance to the nation.

The query that many eastern people are now making is: "What is this irrigation problem before Congress? Is it a legitimate one for the Government to consider? Is it one whose support will be a benefit to the country? Along what lines is it drawn? In short, is it a question of really national import?

Its western advocates, regardless of political affiliations, claim that it is the most important national question to-day. Eastern legislators, regardless of party, are inclined to smile broadly at this assertion.

If the internal history of the American Republic is studied carefully, however, the conclusion will be reached that national irrigation, properly wrought out, is likely to shortly come to the front as one of the most important national questions of the day. It embodies, in its truest sense, the question of home-building, and the American people have been, up to the present time, essentially a nation of home-builders. In no country in the world is the desire for home-building so strong. The wish to own and have and live in homes has led thousands of Americans to endure trials and hardships, and brave dangers almost beyond conception. This controlling wish of the American people has conquered a continent. The hardy pioneer with his family and his earthly belongings stowed in his wagon, looking for a home, has accomplished this. The locomotive has only followed the prairie schooner.

Now, what has this to do particularly with irrigation? Simply that the opportunity for home-building under the old order has disappeared. New, cheap homes, within the means of the hardy settler, are, under favorable conditions, no longer available. The opening here and there of a strip of good land to settlement, such as Oklahoma, and the following rush of immigration, attests to this and also to the fact that the country is still full of home seekers. Where, then, will they now turn?

The new homes of the future must be found on irrigated lands. There are, according to accepted Government reports, some 74,000,000 acres of rich western land capable of irrigation if the western waters are properly conserved. Irrigation is not an experiment in the United States, and there is no question raised as to the feasibility of this reclaimation, but irrigation development in a private way has reached its limits. But, since under irrigation, yields are very large, a few acres of this land would generously support a family, so that with the lands irrigated rural homes would be provided for millions of citizens, waiting and anxious to go upon them.

The advocates of the national irrigation policy urge that the Government should, where possible, build storage reservoirs to catch the flood waters of the western streams and thus provide for the reclamation of these lands. The Newlands bill, now before the House Irrigation Committee, and its counterpart, the Hansbrough bill, on the Senate side, provide for the setting aside of the proceeds from the sale of public lands in the arid States and Territories as an "arid land reclamation fund," to be used for building such reservoirs, and that the cost of such construction shall be put upon the land reclaimed by them, and the land then offered for sale by the Government in small tracts to *bona fide* settlers, upon easy terms.

Who will come to the support of such a policy? More people and a greater diversity of interests than supported the homestead act, and such legislation would be even more popular than the free home enactments. What other proposition is before the country upon which labor and capital can better unite and which they can support, hand in hand, without clash or jealousy? Every labor union in the United States, which has discussed the question, has unanimously supported it; every combination of capital, of whatever sort, which has considered it, has given it unqualified endorsement.

The opening of the vast area of western lands by irrigation would provide cheap homes, certain of returning the owners a comfortable livelihood. It would create a valuable and growing market for every kind and description of manufactured product, and would thus be favored by all classes of manufacturing and commercial interests in the country. It would insure cheaper living in the West, which would result in the opening of numberless mining properties whose grade of ore is not sufficiently high to warrant development under present wage conditions. It would create a demand for transportation which would bring to its support every railroad interest.

Can any proposition ever before the American people claim the support of a greater diversity of interests than the irrigation and reclamation of the vast and waste areas of arid land under an honest

policy, which would insure their settlement in small tracts by genuine home-builders?

The theory of State cession grew out of the old idea that the National Government never would do anything for the reclamation of the arid public lands. Nothing is more certain now than that the Federal Government will inaugurate a policy for their reclamation, and the necessity for State cession is thus withdrawn. The reclamation of the arid public lands could not be accomplished by their cession to the States for many reasons.

The rivers are mostly interstate streams. Those rising, for instance, in Colorado and Wyoming flow into or through seventeen States and Territories. The States have not the financial resources. They will not provide the necessary capital by direct taxation. It cannot be raised by bonding the land. This has been tried and failed. The States cannot raise the money by the issuance of State bonds The people would not vote them in any of the States, and many of the States have already reached the limit of indebtedness under their constitution.

Again, the history of all State land grants has been that they are squandered, and the purpose of the grant is not accomplished. Past experience is a warning against State cession for this reason. Conditional State cession is utterly impracticable. No conditions could be imposed which would not be evaded, and the confession that conditions are necessary is the strongest argument against State cession. More than all this, there is a bitter antagonism to State cession in the West which is so deeply rooted that the West itself would repudiate such a policy. This was demonstrated in the last two sessions of Congress by the large number of strong petitions coming from the West in opposition to State cession. In the East the opposition is still more intense, and it is certain beyond question that no general policy of State cession could ever be passed through Congress.

This being so, and it being beyond question possible to secure the inauguration of a broad policy for the reclamation through the National Government itself of the arid public domain, the wise policy for the West is for the people of that section of the country to stand united in urging the speedy inauguration of the national irrigation policy. The two, however, cannot go together. State cession would kill the national irrigation movement. The strongest argument to induce the Government to undertake the construction of reservoirs and irrigation works in the arid region, is that the Government is the largest land-owner in the West. If the Government parted with the land and gave it to the States, it would be upon the theory that the States could take the lands and build their own reservoirs and irrigation works. This they fail to do, and enormous detriment to the West would inevitably result by such a disposition of the lands.

IRRIGATION IN HAWAII.

Irrigation is transforming the Hawaiian Islands. On Mauri, one of the larger islands of the group, an engineering feat has just been successfully carried through that has not its equal in the Pacific Islands. To supply water to the Spreckelsville plantation a canal has been dug along the slopes of the great crater of Haleakala, and by it a stream of water flowing 50,000,000 gallons daily is brought a distance of twenty-two miles and thence distributed over the plantation lands.

It was no ordinary undertaking, the building of this great canal, for in those twenty-two miles from Kailua Gulch to Spreckelsville there are gulches and canyons by the score, each of which had to be crossed, and there are a dozen or more high ridges, to pass through which it was necessary to dig tunnels, some of which are nearly half a mile in length.

The most striking feature of the "ditch" is the manner in which it is carried over numerous gulches which scar the sides of the great extinct crater. Some of these gulches are very deep, and their sides are nearly perpendicular. To cross them pipe lines are used, not stretched across on trestles, but following the less expensive and more stable method of dropping into the gulches and allowing the water to flow on the principle of the inverted siphon. Of these siphons there are twelve along the line of the ditch, winding up and down like huge serpents, all constructed of quarter-inch pipe, forty-four inches in diameter. The most striking of them crosses Maliko Gulch, a gash in the slope of the volcano which stretches nearly from the summit to the sea, and which is 350 feet deep and less than a quarter of a mile wide. Across this gorge it seemed next to impossible to carry a siphon, but it has been done, and the works are in successful operation.

THE DIVERSIFIED FARM.

In diversified farming by irrigation lies the salvation of agriculture.

SUGAR BEETS.

At the present time there is no subject which is attracting so much atttntion in the agricultural world as sugar beets. A few years ago this crop was not known in the United States, but last year there was beets enough raised to supply 35 factories in this country, and more are being raised for new factories every year. Every agricultural journal is taking up this subject, and farmers all over the country are advised to try this crop. Since the people of Utah demonstrated that beets could be successfully raised under irrigation, the arid states have become greatly interested in this crop and before many years, these states will become great sugar producers as was predicted by H. W. Wiley in a government bulletin issued in February 1899. The results which have been attained in Utah and Colorado the last few years demonstrated that these states are particularly adapted to this crop and that there is a great future for the sugar industry here. Last year two factories were built in the southern part of this state, and the best five year's crop of beets ever produced in the United States was grown. Such results have given a great impetus to the industry there and are attracting attention elsewhere. A year ago, when this industry was being agitated there, the farmers were afraid to take hold of this new business. They were making good money raising melons, and were loath to make a change, but when a factory was promised, the progressive farmer signed contracts for five years and determined to give the crop a trial. They were assisted in every way by the sugar company, and a splended crop was the result. This year the American Beet Sugar company at Rocky Ford have more than doubled their acreage. In one small district alone, the contracted for over 1500 acres, where they had 536 last year. Farmers who followed the advice of the field superintendents, cleared from $10 to $100 per acre. The way they have increased their acreage shows they are well pleases with the crop.

At Lehi, Utah, last year they had a short crop because of the scarcity of water, but the year previous they planted 960 acres of beets, which yielded an average of 16¼ tons per acre, or a total of 15,840 tons, at $4,50 per ton, brought $73,530. The cost to produce this crop, including the work done by the farmer, was $32,600. This left them a net profit of $40,930.

The people of northern Colorado are fortunate in having a factory located in in this part of state, so the farmers can demonstrate what they can do with this crop. Everything at present points to a success. We have the soil, the climate, the water, the favorable natural conditions, and if the farmers give this crop the careful attention they give to other crops, then success is assured, and other factories will be erected here. But in spite of the success that has been made around them, many farmers are still afraid of this crop and are willing to let the other fellow make the start. It is true the potato is a splendid crop here and will never be entirely supplanted by sugar beets, yet that is no reason why we should not have another good crop, one which pays well and has an ab-

solutely sure market and a fixed price. There are many good farmers who have faith in sugar beets, and have already contracted so there will be many fields of beets in the vicinity next summer and if these are planted on suitable land and given proper care we will harvest some splendid crops in this section. But beet farmers must not forget that beets must be planted on good land and not on land that will not produce other crops.

If the people of this vicinity want a sugar factory, they now have a splendid chance to secure one, If they demonstrate to the world they can grow sufficient beets of the proper quality to supply a factory then they can get one, but capitalists will not invest their money unless they are reasonably sure of getting good returns.—Walter L. Webb, in *Greeley Tribune*

UTAH WHEAT IN EAST.

Several weeks ago a few carlords of Utah wheat were shipped East as an experiment. Says the *Semi-weehly Tribune.* It has always been claimed by Eastern millers that the irrigated wheat of Utah was not as good for flour as the product raised without irrigation. They gave an excuse for this the fact that there was much more water in the Utah wheat than in the hard wheat of the East. Bakers of this city seemed to have become imbued with this idea, too,and so they imported some of the hard wheat flour of the East to mix with the soft-wheat flour of Utah. The result was a very superior quality of bread, it is claimed, and this Utah wheat was sent East to allow the bakers there to test its worth in conjunction with their own. The experiment has proven to be satisfactory, and as a consequence there is quite a demand for Utah wheat in places where the result has become known. "There are probably 10,000 bushels of Utah wheat going out daily," said a shipper yesterday, "and it reaches points as far east as Connecticut and as for south as Tennessee. The value in the mixtuse of the two seems to be that the soft wheat grown in irrigated countries gives a flavor to the bread, when it is judiciously used, that cannot be obtained when all hard wheat is used; and on the other hand, the hard wheat gives strength and color to the bread that cannot be had here without its use. I look for very good results from the experiment.

KEEPING IN THE OLD RUTS.

M. F. Jackson, of Des Moines county Iowa, writes the followiug to the Prairie Farmer.

We all know how hard it is to get a load out of old ruts. It takes great effort on the part of the team. So it takes unusual effort for men to get into new ways of doing things. We are prone to do as our fathers did. We love to follow in the good (?) old ways and tell of the profits made when we were young. We read of the experiments made at our agricultural colleges; we wonder at the reports, but often fail to profit by them. This can be said of many farmers who read agricultural papers. We are advised to harrow corn before it comes up and after it is up, but many are sure such a course would be disastrous; their fathers never harrowed corn. Last year a neighbor had corn up four inches high. The weeds were showing thickly. He had no help and said the weeds would get ahead of him, he feared. I advised him to harrow it with his three-section harrow. It would cultivate the corn, and be death to many of the little weeds. He could cultivate the corn easier and better. There was no trash on the field, but he was sure harrowing would cover up and tear up his corn, doing more harm thon good. He would keep in the old rut. Too many farmers keep their hogs in rather small enclosures, while they know the hogs would do much better if they had green feed, for

hogs are grazing animals. But hogs cannot be turned into pastures for the stock law has spoiled all our fences for hogs. There seems to be no other way—so they think—but to feed corn and water. There is no money to buy slop stuff. All the money is needed for something else. Last year a man had no pasture for his hogs for it had been overstocked and the grass was all killed out. Something must be done. He penned up his twelve sows and let his forty-five pigs run free. He sowed oats and rape on one three-acre lot and disked them in as early as the ground would work well. His hogs were turned into this lot about May 15–20 and they had plenty of green feed till late in July. His small lots were shoveled and sown thickly to rape. How the pigs enjoyed the sweet, tender rape as the lots were successively opened to them! Now he added shorts slop and continued it. Another lot of three acres was plowed and fined. Early potatoes and sweet corn were planted. At the last plowing rape seed at the rate of three pounds per acre was cultivated in. The potatoes were dug and the pigs were turned in in August. The sweet corn lasted them a month and they had no care save being watered. The rape continued growing till heavy frost, and the pigs ate it until December Twelve calves were turned in for two weeks to help save the rape: and then much of it froze down. This man got out of the old rut of feeding corn only, and thinks it paid him $50 to $100. He never had pigs do better. They had all the corn they could eat quickly. My clover all killed out. Plans for pasturing a carload of calves were seriously disturbed. I wanted my farm to pasture them so that Iwould not have to hire pasture as I had often done before. Twenty-eight acres of pasture had been prepared for them; fourteen acres were old meadow of clover and timothy, and fourteen were new in clover. The clover was all killed and the part in new clover was bare ground. One peck of timothy and clover seed and two bushels oats were sown to each acre and disked in. The old meadow was left to itself. The young cattle were turned in the latter part of May and they staid over five months. I cut six tons of timothy hay. This was not big pay, but it beat six per cent and the cattle were at home. Farmers would do well to experiment more. Profit by the experience of others. Few of us do as well as we can, nor as well as we might if we turn more of the things we read into practice.

THE MATTER OF POTATO PLANTING.

Nearly every farmer is interested, to a more or less extent, in the matter of growing potatoes, whether he grows merely a sufficient amount for home consumption, or wheather he grows a large acreage for the purpose of marketing. It is interesting to note the results of experiments made by many potato growers in the method of planting, For instance, in the planting at different depths in rows from two to three feet apart and twelve inches apart in the rows. It has been ascertained that this method of planting produces large yields and the crop can be cultivated with ease. Level cultivation is recommended, and but very little soil is thrown on the potatoes. Potatoes will develop more rapidly in warm soil than in that which is colder, consequently as the soil for the first three or four inches of the surface is warmer than in the three or four inches lower down, the condition of shallow planting are more favorable, and it has been demonstrated that level cultivation and shallow planting is the best for many soils. On the other hand, much of the success of shallow planting will depend upon the moisture of the soil. If the season is very dry the first two inches of soil may be so dry that the potato will not take root rapidly, and the season of growth will thus be shortened, but such a season will not occur more than once in five years. From

results carried on at some of the experiment stations, it seems reasonable to conclude that where the soil is not dry the best results may be obtained from shallow planting. In any case early planted potatoes will probably succeed best when planted shallow, and in places where the spring is late, or where the ground is cold, best results will always be had from shallow planting.

DIVISION OF FORESTRY.

Interest in scientific forestry is rapidly increasing in the South. A preliminary examination has been made by the Division of Forestry of the U. S. Department of Agriculture of the largest forest in Polk and Monroe counties, Tennessee, owned by Senator George Peabody Wetmore, of Rhode Island. The examination has established the suitability of this tract to be handled under practical forest methods. Work will now be begun and pushed in making a working plan for the forest, which contains 84,000 acres of hardwood timber.

The Division has also received from the South two other important requests for expert assistance in forest management, both from owners of private tracts. The first is from the Okeetee Club, which owns 60,000 acres of Shortleaf Pine land in Beaufort and Hampton counties, in South Carolina. Mr. Overton W. Price, Superintendent of Working Plans in the Division of Forestry, will make a preliminary examination to ascertain whether a working plan for the tract is feasible.

In addition to Shortleaf Pine, this tract contains Cypress in the swamp lands, and also some hardwood timber. The Okeetee Club's tract borders on the Savannah River; with markets by water and rail at no great distance.

The other request to the Division for assistance comes from northwestern Georgia, where a preliminary examination of 16,000 acres of Shortleaf pine is wanted.

The Division of Forestry, through its section of tree planting, has succeeded in arousing widespread interest in the subject of tree growing on the plains of the upper Mississippi Valley. An agent of the Division has recently returned from that region and reports that the farmers in the territory west of the Mississippi and north of the 40th parallel of latitude are awaking to the importance of planting trees, especially for economic purposes. The planters of this section are anxious to avoid the mistakes made during the operation of the Timber Claim Act. The groves now being planned are designed to be permanent features on the homesteads.

To that end, the farmers will use a greater proportion of long-lived, slow-growing species than formerly. The demand for such hardy, drouth-resisting species as the Hackberry, Green Ash, White Elm, Bur Oak, Red Elm, Red Cedar, and Western Yellow Pine (Bull Pine) promises to be greatly increased during the next few years. The greatest present difficulty with which the prospective tree planter has to contend is the fact that commercial growers of nursery stock are not supplied with this kind of material. The nurseries still carry large quantities of the short-lived kinds, such as Boxelder, Cottonwood, Maple and Willow, but are short on the more valuable species.

The planting of conifers on the prairies of the West during the past has not been attended with general success. This is owing to the use of eastern and introduced kinds that are not adapted to the country. There is abundant evidence, however, that the Red Cedar and Western Yellow Pine (Bull Pine) will thrive throughout this section. The desirability of evergreens for wind-breaks on a bleak prairie should lead owners to turn their attention to these hardy native species.

A matter of considerable interest is the forthcoming publication of the working plan for township 40, in the New York State Forest Preserve. This working plan as published will contain maps, illustrations, tables, rules for cutting, and estimates of stand. It will be of especial value not only to people interested in forestry, but to lumbermen as well, since it is the result of careful investigations by a practical forester and a practical lumberman.

The working plan for Township 40, is the first made by the Division of Forestry for State land in the Adirondacks. The Division at the request of the New York Forest, Fish and Game Commission for expert assistance undertook to make working plans for the 1,250,000 acres of woodland composing the Adirondack Forest Preserve, of which the working plan for Township 40 is the first. This work is being done with a view to obtain a regular income from the State forests in case of the repeal of the constitutional clause which now prohibits lumbering on State lands. Systematic cutting under skilled forest management would benefit the future growth of the forests, improve their present condition, and give the State a large and increasing annual income.

The State Line & Sullivan Railroad Company, and the Long Valley Coal Company, all with headquarters at Towanda, Bradford County, Pennsylvania, have made application to the Division of Forestry for assistance in preparing a plan to prevent the occurrence of annual forest fires on their properties. Mr. H. McC. Curran of that Division has been sent to investigate the matter and report upon the conditions, in order that the Division may be prepared to offer advice for the prevention of fires.

Among the recent applicants for advice and assistance in the management of its woodlands is the Moose River Lumber Co., which owns a tract of 16,000 acres in the Adirondacks (N. Y.). This tract is mostly Spruce land and is situated in Herkimer County. The preliminary examination has already been made by one of the experts of the Division of Forestry and the working plan will be prepared this spring. It will contain estimates of the present and future yields of timber on the tract, and will also make recommendations regarding the lumbering. This application, taken with those which have been received from other owners of private forest lands in the Adirondacks during the last two years, brings the total area of private land in that region, for which working plans have been requested, up to more than 400,000 acres. On 140,000 acres these plans are already in operation.

ODDS AND ENDS.

THE STAR TROTTER

By Murt H. Bassett.

"Take her to the Washingtonian Home for a month and get the "dope" out of her," ordered his honor, as Officer Morierty ambled out of the dock with "Cocaine Meg," of Plymouth Place. "Now, Mr. Prosecutor," continued the court in a lower tone, as he cast his eye down the trial sheet, "what the duce is this next name?"

"You've got me there," replied the alert young lawyer, giving his cuffs an extra twist, and fastening his eyes on the trial sheet over which the police judge was puzzling, his brow wrinkled with perplexity. "It looks like O. K-y-a-n-y-a-n," slowly spelling the name.

"I know as much as that, confound it, but that don't elucidate to my confused intelligence the pronunciation," retorted his honor with a trace of irriscibility in his tone.

The hum of conversation and shuffling of feet had by this time hushed in the Harrison street station police court, the usual noise of the dingy temple of justice hushed to a subdued, expectant surprise at the unusual lull in business while the colloquy between the magistrate and his adviser proceeded. Time enough had been wasted in the busy whirl of Harrison street to have sent six "Hop" fiends to the Bridewell. Seven stalwart policemen, "the very foinest," stood with their backs to the clerk's desk waiting for their cases to be called, and each beat a subdued tatoo with their clubs on the spike-like palings, and each had a look of impatience on his face.

"Indade, Oim iv th' opinyon, ye's honor, that th' nex' case is me own," remarked Officer Doherty, leaning over the railing dividing the trial dock from the raised diaz where sat the purveyor of justice. "Th' same is an ould mon I bagged on the Hubbyard place lasht night. Oi think his name is Cayenne, an' tis he that is a pippery wan, himself."

"That name will do as well as any," remarked the court and he proceeded with the broken thread of business by calling the case in a loud tone.

Slowly and with faltering steps a decrepit old man, with snow-white hair and beard, the latter long, pointed and unkempt, moved forward in response to the beckoning finger of Officer Doherty. He was a spare piece of humanity. He had once been tall but was now stooped and bent with age; his fingers were long and bony. His complexion was swarthy, yet sallow, as

of those peoples whose ancestry have made their homes for centuries and generations beneath the scorching suns of the tropics. His nose was like the beak of an aged eagle, while his small, black, restless eyes glistened nervously beneath shaggy brows. In his right hand he carried a greasy red and yellow turban, removed from his head in deference to the court.

"Well, officer," said the court, merely glancing at the trembling culprit, and resuming the brisk brusqueness that was his habitually, "What have we here? What's the trouble with the aged one?"

"Yer honor," rattled off Officer Doherty, "This mon was stoppin' iviry wan on Sthate street an' was bumpin' thim fer th' coin an' I copped him. I think the ould mon is a habitou of Wan Lung's jint that was closed up lasht wake."

"Most high and noble Judge, learned arbitrator of the disputes of man, the blue-coated minion doth me wrong," spoke the prisoner. Canst I be heard, most noble judge, for my cause?

On receiving the assent of the court, coupled with the admonition that "Time is money," the old man spoke as follows:

"It is mete, most mighty judge, that I should recount to your wise and learned ear the wonderful story of my life. Know then, that I am Omar Kyanyan, son of Indaranth Kyanyan, the great ruler and maharajah of Sanganphore in India, and last in power of a dynasty that traces its lineage to the time when the leaves first turned green, when even the sacred Veddas of our loved land were young, and Bramah himself, in form of man, meditated on the mountain tops and in the forests of Hindostan. One hundred and forty years ago my mother brought me forth in the diamond-studded and gold-cealed room of the maharajans. Early I studied and learned of the magi and of them was taught the mystic, occult symbols of the brotherhood. Greatness was mine by birth and happiness by attainment, for on reaching the lusty season of manhood I clove as the wild fowl to his mate to Irmyrallis, the beautiful, known as the "forest flower," daughter of the rajah of Bengal. But greatness and happiness were brief. The hated scarlet-coated warriors of the Woman of the West took from me my domain. This I could have suffered and borne, but when they dishonored my sacred religion, and a scoundrel they called "Sergeant Brick," because his hair was the color of the clay, baked long and hard in the heat of the great fires, tore my "Forest Flower" from my arms, I joined my cause with those who swore to rid our land of the hated hirelings who carried the death-dealing missiles immersed in the grease of the condemned, unclean swine."

"Your tale, I must admit, is somewhat interesting" interrupted the judge, "but it is stringing out unusually long for Harrison street station. Can't you get to the point?"

"Yes, sahib—most honored and O, most noble Judge, thou hast spoken wisdom, and thy words drop

on my weary soul like the sweetest dewdrops on the parched soil," replied the culprit, "but though the tale be somewhat long, yet my wondrous story will well entertain you, have you but patience to hear your unworthy servant to the end. Know, then, that our courage availed but little against their cunning, and Siva must have been on their side. We were soon conquered and our land laid waste. I, O, honored Judge, was among those condemned to be shot from the yawning mouth of the cannon. Then, before the hated lines of the ruffian red-coats I was jammed into the immense gun, and the fuse was ignited. I passed through an age of apprehension and suspense, then followed a terrific detonation. There was a glare as fiery red as the burning waters in the bowels of the mountain crater. The immense gun hunched on its haunches like the elephant on the long pull. I seemed to be burned and torn, and then I shot upward through space and consciousness was lost.

"How long I was bereft of sense is past my ken, but it must have been for hours, for when I gained sensibility I was floating through the realms of space. The cool, refreshing breeze of heaven was fanning my fevered brow. Where am I? Where am I going? These questions rushed through my mind, but were unanswered. I was moving. It seemed to me my progress was upward. My motion was a gentle, undulating one, as of a person floating upon the gentle billows of a friendly sea. I felt as light and airy as the leaf, dried by the hot caress of the sun and separated from the parent stem, tossed by the zephers of autumn. On, on, on, I traveled, and the thought fastened itself in my mind that I was the soul of my former self moving through the refreshing interspace to meet another earthly shell and take up my abode in a new tenement. The down that is wafted from the thistle could float no more lightly than I, and lulled by the cadences of space I fell asleep, but to awake again and feel the same sweet abandon. I cared not for food or drink. The freedom and ease of the bird, the eagle that soared above the rocky crags and rose and fell on the ripple of the breeze, was mine. Elysium was mine it seemed, and could I float for everlasting ages in this same sweet way no greater bliss could I ask.

"At last I fell into the softest, most gentle slumber. My rest and dreams were like those of the babe that sways in the grass hammock, soothed by the croon of the happy mother, when the torrid air penetrates even the tangled meshes of the banyan, but is cooled by the moistened curtain of the bungalow.

"From this sweet slumber I awoke at last to the music of lutes more charming far, it seemed to me, than those I had imagined are heard in paradise. Gently reposing on a soft sward I opened my eyes in wonder, expecting to find that I was but the victim of a happy dream. But I found myself the cynosure of a swarm of people.

People they were of bright countenances and attractive dress, but differing in every way from those I had known in life; for it seemed to me sure now that I was through with earthly life and had entered upon a celestial existence. They were formed in lines of manly beauty, the style of dress of each being identical with all others—a rich, soft purple gown that swept in easy folds from shoulder to heel. Their skins were blue, not the cold, harsh blue of earth, but the heavenly soft tint of the summer sky. Their eyes were a deep, glowing red, beaming with warmth and kindness, like the traveler's fire upon the bleak mountain. Their hair was ringlets of yellow, rivaling the sheen of gold. Clustered thick around me their appearance was pleasing.

"To my eager, excited questions they quick gave answer, and though their tongue was new it was not strange; I readily and quickly understood. I was first kindly informed that to them I was a stranger from the far-off earth, and that I had fallen upon their planet, which they called 'Emusra.' Furthermore they told me that they had watched my progress through space and since I had left the earth they had by aid of their powerful instrument directed my course through space, being anxious to receive a visitor from earth. I readily learned that they were adepts in science for they quickly showed me their Universe Searchers, small instruments that one could hold in the hand easily and view the minute doing of mankind on the far away planet which I inhabited and from which I was unkindly thrown. But, most noble judge, it would take ages for me to tell you all about those people. They lived and had their beings in a different, a higher, grander sphere than ours. Their mode of living was reduced to a science. Instead of food and drink their sustenance was happy thought, and they were far above the grosser forms of life, physically as well as mentally.

"I found that 'Emusra' was the scene of peculiar conditions. It was but a small dot in space being but 100 miles in diameter. Day followed night very quickly, each being but a little more than an hour in duration to my mind but to these people the diurnal change was equivalent to ours and their days and years were quickly spent. One thing I early noticed and that was that there was an extreme number of beautiful birds, myriads of them in the trees above and that they were posessed of the powers of reason and speech in even greater degree than the men and women. I was shortly told that the birds were living the after life, or in other words were the souls of those who passed from life as a human in 'Emusra'. No one died on Emusra but was 'restricted.' The planet was densely populated, so much so that methods were taken to thin out the people. At certain places on the planet were 'Restricters.' These were large machines of the nature of catapulets worked by ingenious mechanical devices. Every

morning a certain number of 'Emusrans' were 'restricted' by being placed on these machines and shot upward into space at a startling velocity. Thus was the population kept within bounds, and without it they assured men that there would soon be not even standing room on the planet. There was no mourning among friends and relatives when an 'Emusran' was 'restricted,' for the next morning that one would appear in the form of one of the beautiful birds overhead and hold refined converse and association with the loved ones left behind.

"Age was the test for candidates for 'restriction'—and in testing for age years were not counted—for they reasoned that a man may be old in years yet young in vigor of life. So the test of senility was the number of hairs in the heads of the people, silvered by time or trouble, either cause being deemed sufficient to entitle the candidate to restriction. Here it might be remarked, parenthetically that there are no hairless-headed people in 'Emusra.' The candidate for the offices of the catapult was first submitted to the hair counter, an ingenious piece of mechanism that counted the grey hairs in the head as quickly noble judge, as you would snap your prosperous finger. If two thousand silver hairs were found the candidate was placed upon the 'Restrictor,' and his transmogrification accomplished.

"Brief indeed, twenty days, forty hours, earth time, was my stay among these people, when at last submitting to the examination as they who inhabited that planet must submit, I was found to be eligible to the 'restrictor.' With pleasurable anticipation of a happy after life in a new form, I stepped upon the catapult. The mechanism was touched and I, as I had seen many 'Emusrans', shot upward again into space.

"From that moment, Most Noble Judge, I lost consciousness again. I remember no more until yester e'en, as the sable shades of night were falling I found myself floating and splashing upon the waves of your noble lake. Crawling upon the shore I wandered through the streets of your wonderful city. Meeting a pedestrian I inquired of him my whereabouts. He told me this is Sheecauga in America. Just then your minion of the blue coat seized me, and after confinement in a noisome dungeon for the night I was brought into your noble presence."

The "court" sat back on his throne of justice "paralyzed" in wonder. The clerk found voice and pronounced the trembling culprit the "prince liar, or the wonder of the ages." Officer Doherty shook his head in wonder, while the hold-up men, the panel gang and all the combings from the vice-ridden districts had a look of awe-struck wonder on their faces, at the grewsome tale of the maharajah.

Just then a farmer, who had been held up at a stock-yards saloon of his money received for a consignment of cattle, and who was present to testify against his assailants, stepped forward and said:

"Jedge, this man is the biggest liar in the state. I hev knowed him for twenty year. His name is Bill Jimplin an' he used to run a livery stable down to my hum, Newton, Ellenoy. Five year ago he moved to Chicago. Bill uster tell some purty big yarns but this beats any I ever heard him tell afore."

"Omar Kyanyan, or Bill Jimplin, started to angrily expostulate a denial, but the court stopped him. "you may go," said his honor, "get out of here quick."

The Star Trotter lost no time in ambling out of the court room and soon trudged out of view on Harrison stseet.

Prof. Elwood Mead, of Cheyenne, Wyo.. who lost an arm by falling beneath a street car in Washington, is reported as gaining steadily and will be out of the hospital soon.

For several days, ever since his arrival in Washington, in fact, Mr. Mead has been very busy before the Industrial Commission, and at the same time making preparations for an extended trip through Italy, where he expected to study the Italian method of irrigation, said to superior to our own, with a view of introducing their advanced practices into this country. He had planned to sail in about two weeks. Many inquiries were made at the hospital today as to his condition, every one expressing deep regret at his misfortune.

ABOUT EXCHANGES.

SATURDAY EVENING POST.

The Saturday Evening Post of June 8 contains an article by Chas. Emory Smith, Post-Master General of the United States, entitled "How Conkling Missed Nominating Blaine." It is a bit of inside history concerning these two noted enemies that will be of interest to all who remember the "plumed knight" and his ambition to become president. A serial story of absorbing interest is that of "Calumet K"--A Romance of the Great Wheat Corner, by Merwin-Webster, the third installment of which is given in this number. S. W. Allerton contributes "Business Methods in Farming," and Frank G. Carpenter tells us of "The Japanese Emperor at Home."

THE DELINEATOR.

The Delineator for July gives the usual fashion plates and hints on what is worn, and also an article on the Pan-American exposition. With this are given a number of beautiful illustrations, some of them in colors of the exposition buildings. "A Dream of Red Roses" and "According to the Code" make up the fiction department.

M'CLURE.

Are women better than men? This is a question that E. S. Martin asks and answers in an article entitled, "Women," in *McClure's Magazine* for June. No better, only different; or if better, merely in a negative fashion. They drink less, smoke less and certain of their emotions are less strong than corresponding emotions in men. Women are what men make them, and while men are still appreciably far from perfection, why, women will be still a little short of the angels they are sometimes represented, and what is worse, expected to be.

LADIES HOME JOURNAL.

Maxfield Parrish's fine decorative design on the cover of the Ladies Home Journal for June forms a fitting introduction to a remarkably attractive issue. Among the most interesting features of this number are a double page of pictures, entitled "Where Golf is Played," showing some of the handsomest country club houses in America; a series of curious "Love Stories of the Zoo" told by Clifford Howard; the

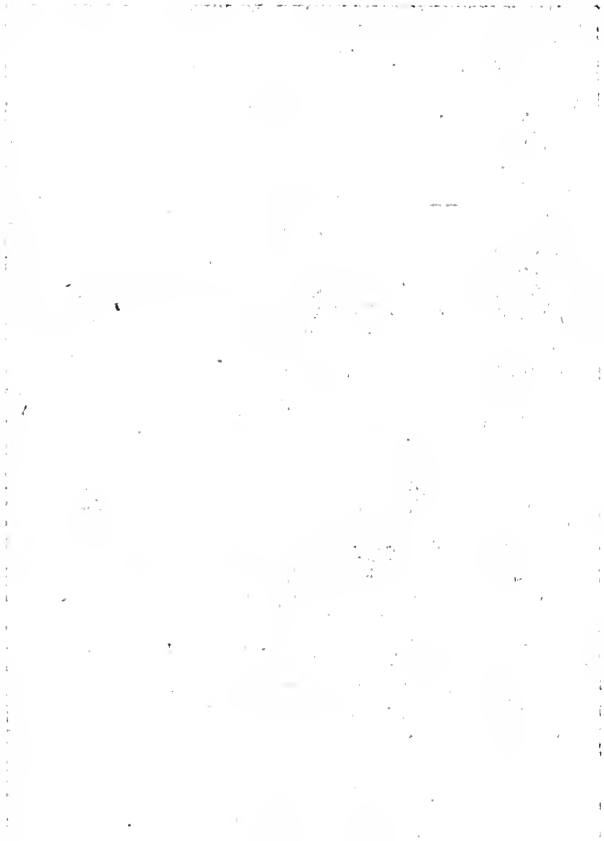
first installment of a facsinating new serial, "Aileen," by Elizabeth Knight Tompkins; a touching full page picture of "The Passing of the Farm," by W. L. Taylor; the queer experience with "Some People I have Married," by the Rev. D. M. Steele, and a vigorous article on "Women as "Poor Pay," by Edward Bok. Numerous other articles of general and domestic interest fill out the rest of the number.

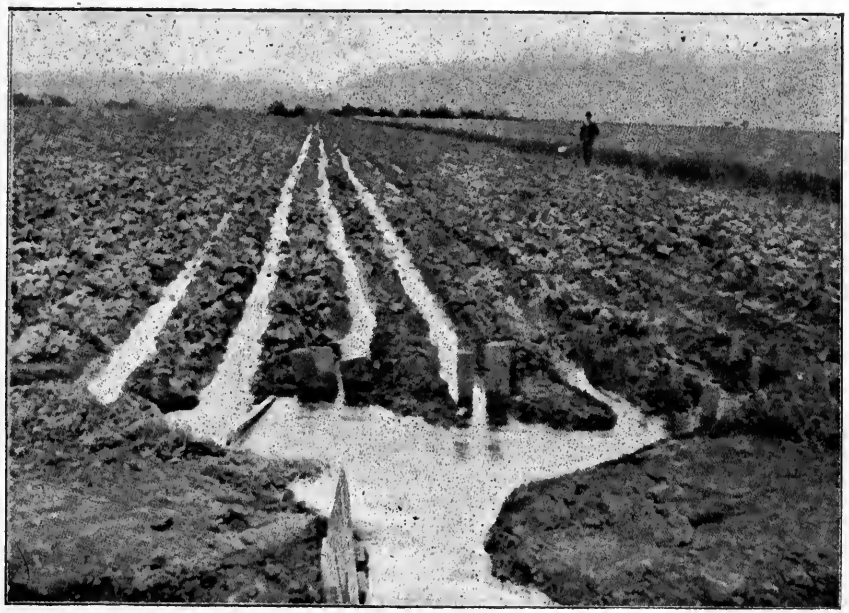
SCRIBNER'S.

An unpublished diary by Faancis Parkman, the great historian, will appear in July *Scribner's*, followed by Senator Hoar, in his estimate of great orators that he has heard, places Edward Everett at the head of all American orators. The romantic beauty of Sicily by Prof. Rufus B. Richardson. John La Farge, will describe an aristocratic family of Tahiti, whose sons and daughters have been educated in Europe and speak all the languages of civilization while preserving many of the traditions and customs of their barbaric ancestors. Leroy M. Yale has been all his life an ardent fisherman. He tells, with rare literary skill, the story of a quaint New England character, "Uncle David," from whom, as a boy, he learned the art of fishing and hunting. A member of the Coast and Goedetic Survey, G. R. Putnam, will tell of a trip which he took in out-of-the-way portions of the Yukon Delta in Alaska. Mrs. Julia C. R. Dorr, the aged poet, will have a poem on her summer garden, Mr. Seton-Thompson's biography of "Krag, the Kootenay Ram," will be concluded.

WOOD VATEB PIPE.

An artistic pocket catalogue of Wyckoff's Wood Water Pipe can be had free upon application to A. Wyckoff & Sons Co., 101-111 E. Chemming Place, Elmira. New York. It described the different kinds of Wood pipe manufactured by them. the uses they have put to and gives a long list of names of parties who are using them. The price is cheaper, and it is easier to handle than iron pipe, as it is made in lengths of from four to eight feet, and can be laid by an ordinary laborer, no special tools being required. Write for one.





THE IRRIGATION AGE.

VOL. XV. CHICAGO, JULY, 1901. NO. 10

Government Survey. The Geological Survey is making surveys of reservoir sites in various sections of the arid region. There are many fine opportunities for mountain storage of the waters now wasted in floods, as every western man knows —storage which would later render barren plains and valleys fertile and smiling with crops and dotted with small homes. Against the time when this saving of a valuable commodity must be undertaken, the determination of the best reservoir sites should be made and the sites, with their adjacent drainage basins, should be reserved for such use. This work the hydrographers of the Survey have been engaged upon for some ten years, and hundreds of great natural basins, lacking only dams to be converted into lakes have been surveyed and reserved by the Government. This is work of the utmost importance to the future of the west and of the whole country, and it should be vigorously prosecuted. In the west water is the measure of land values. It is essential that these sites and their accompanying watersheds should be preserved from deforestation and misuse.

The Increase in Population. Conservative people who have thought the estimates that the western half of the United States would support 50,000,000 people if its irrigable lands were all reclaimed, to be extravagant and visionery should not lose sight of the fact that large centers of population result from dense agricultural communities. It is generally admitted that 75,000,000 or 100,000,000 acres of highly productive land can yet be reclaimed through irrigation. Probably more than this acreage can eventually be cultivated since new sources of underground and other water supply are being continually discovered, while at the same time the utilization of water is being reduced to a much more economical basis.

But the occupation of any great tract of land by small farmers and fruit growers means the development of cities and towns innumerable. Denver, for instance, is a good-sized city, which derives its support largely from irrigation enterprises. It is a product of irrigation, and there are hundreds of other such centers, all of which would develop enormously in population with a comprehensive system of irrigation an established fact.

Thus the population of the arid region may be destined to an increase far beyond what the actual increase in western cultivatable acreage might indicate.

Worthless as a Gift. There are millions of acres of lands in the arid regions that belong to the Government. That land now is utterly worthless. The Government has been offering to give it away for the last thirty years if anybody would go and live on it. No one will take it even as a gift. Let the Government use its credit to put up irrigation reservoirs, get water onto these dry acres, and then invite the settlers to come, provided that

they will pay the cost of irrigation. See how they will flock there in unnumbered thousands. There would not be a vacant acre left in five years, if men only had to pay the actual cost of irrigation to get a title to the land.

If the great desert stretches of the arid west are ever to be reclaimed and made into comfortable and productive homes for the millions who will seek them, the Federal Government will necessarily have to take the lead and build the storage irrigation reservoirs.

Destroyed the Source. The change in the face of nature caused by the destruction of the mighty forests of Lebanon has permanently impoverished the entire region involved. The Judean valley was rendered arid, and Palestine to-day can support but few people because her water courses have been dried up, for the great trees which sheltered the snows and kept the pitiless sun from reaching into the heart of the springs have been destroyed utterly, and are without successors.

Irrigation in Russia. The Russian Government expends considerable sums annually for purposes of irrigation, and the results obtained have proved very successful. The plan adopted, where there are no rivers, is to construct dams or series of dams across valleys or gullies, and thereby form reservoirs, in which rain or melted snow is collected and stored. From these ponds it is an easy matter to run the water to and spread it over lower levels. The Steppe, which is absolutely flat in but few places, lends itself easily to this system, the great drawback to which is, of course, the initial cost, which can be borne by only a few land owners, a large number of whom have been obliged during late years to hypothecate their estates in consequence of the succession of bad crops.

Hazen S. Pingree. Michigan's famous reform governor died at the Grand Hotel, London, June 18. His death is particularly sad on account of his absence from the home he so longed for, which was shown by his oft-repeated inquiry, "How soon can I start for home." For months Mr. Pingree, accompanied by his son, H. S. Pingree, Jr., familiarly known as "Joe," had been touring South Africa and the continent of Europe, partly for pleasure, partly with a view to enlarging the great shoe business which the enterprise and thrift of the father had built up. He expected to be at his home ere this, and just as he was about to start he was stricken down with the fatal malady, and now only the coffined remains of Michigan's great-hearted governor may be received by his family and friends, where they had hoped to extend to him, in the full flush of life and health, a glad and cordial welcome home.

The career of Hazen S. Pingree was an unusual one. Born on his father's farm at Denmark, Me., August 30, 1842, he remained there his father's helper until 14 years of age, when he was sent by his father to Hopkinton, Mass., to learn the trade of a cutter in a shoe shop. He was 19 years of age when the civil war broke out, and it is only an evidence of the character that has made his name memorable that he was a volunteer in the First Massachusetts infantry. He was one of the men captured by Mosby, the guerilla, and five months following were spent in Andersonville prison, an experience from which he never fully recovered and to which it is believed his untimely death is due. The West offered tempting invitations to a man of Pingree's native ability, and at the close of the war he came to Detroit. There he worked in a produce market until he had amassed the little fortune of $460, and with this he bought a shoe shop that was rapidly going down. This factory grew until 1,000 men were employed and an annual business of more than $1,000,000 was transacted.

A New Application of Electricity. An interesting example of the value of electricity in making profitable, old industries which have fallen into decay, is to be found in the valley of the Yuba River, California, which was years ago the scene of an active search for gold. As much gold as could then be profitably found was secured and the locality abandoned; but the advent of electricity has created a new and unusual activity there. Many miles back in the mountains a large water plant has been constructed for the generation of electricity; by means of the power from this source, the people along the lower and sandy parts of the valley have begun to use huge machine dredges to work the old abandoned placer mines. These dredges scoop up the gravel in which gold is thought to exist, pass it back to be separated and deposit it on the ground behind them. It is an unusual and exceedingly interesting sight to see these great machines eating their way into the earth. They stop at nothing but work along steadily through fields and orchards and leave behind them as complete a picture of desolation as one could expect to find. The operators are said to be making a good thing out of it as the power is cheap and the findings of the precious metal is sufficiently large to bring very good returns. The work was lately watched with much interest by some of the members of the United States Geological Survey who were making a general reconnoisance in that region.

Irrigation West Means Benefit East. The constantly increasing enthusiasm in the western arid states over the results and possibilities of irrigation is a happy omen for the whole country. Hundreds of square miles of territory, before desolate, have been brought under cultivation in this way. Cultivated country means a demand for the necessities of life. Many necessities and most of the luxuries of life, and a large part of the agricultural machinery of the country are made east of the Mississippi River. Hence irrigation means a growing flood of eastern supplies to western markets. Again, irrigation means wonderful production; hundreds of carloads of high priced fruits, ready for shipment each year, from tracts that were poor sheep pastures before. The East wants these car loads of fruit; Europe wants them, and across the country for thousands of miles the railroads carry them. Hence irrigation means two long lucrative hauls of freight, the supplies west and the products east, and the dividends of thousands of stockholders in the East and West alike reap the benefits. There are many other benefits from irrigation, but these are enough. Irrigation is not a sectional matter; it is a great National Question.

Lean Cows and Irrigation The United States Geological Survey has been making some valuable studies on the Great Plains, west of the Mississippi River, in connection with artesian waters. What this vast section needs above all things is water, and it has been estimated that millions of dollars would be added to its value if only a reliable supply could be found. An interesting illustration of the bad effect of the lack of water, during the summer season, is found upon the cattle ranches. The great herds of cattle which roam on the Plains sometimes have extreme difficulty in finding water, especially in time of draught. Their usual drinking places may be miles away from where they are obliged to graze, and it is not at all unusual for them to travel all night or even longer, from the one to the other. As a result of going these long distances at frequent intervals stock becomes poor and thin, and the profit of cattle raising is thereby much impaired. Water bearing rocks are known to exist in large quantities under the whole region of the Great Plains which ought to yield an abundant supply. The work of the Gov-

ernment Survey has been an attempt to locate these strata and find whether it is practicable to attempt to reach them. If they can be found without too deep borings, not only will the grazers receive a great benefit, but land will become valuable for high class agriculture and the support of a large population.

Leader of the World. This country, with its seventy-five millions now leads the civilized world. But with so vast a continent, the resources of which have merely been touched, it is certain that it has only passed the first great stage of its distinction. The new century opens a vista of growth in material and political things that invites the highest ambition of scholars and statesmen, and the best energies of all the people. There will be larger opportunities than ever before, and the rewards will be greater than at any time in the world's history.

Irrigation has already achieved miracles in the far West and it is only in its beginning. Millions and millions of people will find beautiful homes on what are now arid plains. Water will make the deserts bloom like a garden of Eden, just as it has at Riverside and other places in California. Thus there will be on the other side of the Mississippi, in the course of time, as great a population as that which stretches eastward. Every year the centre of population moves westward. Every decade this rate of movement will grow swifter.

BY THE WAY.

Life's a journey,
Not so long,
Try to ease it
With a song.
Birds, though busy
On the wing,
Pause a little
While they sing.
Music soft
The traveler hears
If he doesn't
Close his ears.
Teeming nature
Still finds room
For the fragile
Flow'rets bloom.
Loveliness
The traveler spies
If he doesn't
Close his eyes.

—*Washington Star.*

IRRIGATION IN HAWAII.

(Continued from last issue.)

The power of this soil to take up water is 48.5 per cent. The climatic conditions have already been amply discussed, since the data contained in the earlier paragraphs of this work bearing upon the evaporation of moisture from water and soil surfaces and the transpiration of water by the sugar cane were all observed and recorded at this station.

By the mode of applying water in use at the experiment station every gallon of water that goes onto each experimental plat is measured and recorded. This exactness is absolutely necessary not only in order to note the action of the water, but also that of other factors upon the development and results of the crop. Consequently the records of rainfall and the measurement of the water applied furnish the total water at the disposal of the crop in the course of its growth.

Two crops of cane have already been grown upon the experiment station grounds by the aid of irrigation. The first crop was planted in July, 1897, and harvested 20 months later. The second crop was planted in June, 1898, and is now being taken off (March, 1900.) The period of irrigation, however, extended from the time of planting until November of the following year, making some 17 months during which water was applied. Unless the weather is extremely dry, the cane does not receive water several weeks previous to its being cut, in order to induce a more thorough ripening. Excess of moisture operates to keep the cane immature and induces new shoots to appear and grow, thus injuring the crop.

In the followihg table are recorded the amounts of water the crops received during the years specified as rainfall and by irrigation:

AMOUNTS OF WATER RECEIVED BY CROPS AT HAWAIIAN EXPERIMENT STATION.

Month.	1897-98.		1898-99.	
	Rainfall.	Irrigation	Rainfall.	Irrigation.
	Inches.	Inches.	Inches.	Inches.
July	0·63	3.0	0.94	4.0
August	1.02	3.0	1.58	4.0
September	4.12	1.5	.88	4.0
October	2.07	3.5	1.75	3.0
November	2.11	2.0	1.32	3.0
December	.88	3.5	1.86	2.0
January	6.18	0 0	1.00	4.0
February	8.04	1 0	3.75	1.5
March	10.39	0.0	3.98	3.0
April	1.21	1.0	.85	4.0
May	.84	4.5	2.01	4.0
June	2 60	2.0	.88	7·0
July	.94	5.0	.17	7.0
August	1.58	5.5	1.90	9.0
September	.88	6.5	.75	8.0
October	1.75	4.5	2.92	6.0
November	1.32	1.0	.47	3.0
Total	46.56	48.0	26.01	76.

From the data in the rainfall columns it is seen that the most of the rain falls during the cooler months of the year, which are the months of minimum plant growth. This is a special climatic drawback. The most advantageous combination of climatic conditions is the concurrence of high temperature and maximum rainfall, or a moist, hot season, and a dry, cool season, which combination occurs in the sugar zone of Queensland. It is very apparent that water does not possess a maximum value if it falls during the cool season and when the crop is not in full growth and able to make use of it. For this reason a less value and importance have to be ascribed to the rainfall of these islands than might otherwise be.

The table shows that, during the years 1898 and 1899, the rainfall covering the period of seventeen months was only 26,01 inches, or 18.3 inches per annum. It should also be understood that the extra deficiency in the rainfall can not be measured by the simple amount of that deficiency, for the reason that, instead of the cloudy, wet days when the rain should have fallen, dry days of high evaporation occurred, thus aggravating the natural situation and causing a greater need for the water supplied by artificial means. When the totals of the data contained in the table are brought together, it is seen, however, that the difference in the total amounts of water consumed by the respective crops are not material and no greater than has been reasonably accounted for.

TOTAL WATER RECEIVED BY TWO CROPS OF SUGAR CANE.

Crop period.	Rainfall.	Irrigation	Total.
	Inches.	Inches.	Inches.
1897-98	46.56	48	94.56
1898-99	26.01	77	103.01

Before proceeding to furnish the full results of the two crops attention may be called to the comparative value of the water which fell as rainfall and that of the water applied in irrigation, taking the sugar equivalent as the expression of value. It is possible to do this by the use of data obtained during the season of 1897-98, when tests were carried out in the experiment field under identical conditions of soil, cultivation, and fertilization. In these tests twenty plats of cane were grown by the aid of irrigation in addition to the rainfall, and eight tests were made without any irrigation (PI. IV,) the results being as follows:

YIELD OF IRRIGATED AND UNIRRIGATED CANE.

Number of tests.	Rainfall.	Irrigation	Yield of sugar per acre
	Inches.	Inches.	Pounds.
20	46.56	48	24,755
8	46.56		1,600
Difference in favor of irrigation			23,155

Nothing could show more conclusively than these figures the necessity of irrigation under the existing conditions, and the enormous sugar-equivalent value of irrigation water applied systematically to the cane during the season of maximum growth, which is the summer season. An equal volume of water falling in heavy rains during the cool season, when growth is slow, is largely lost through percolation and produce a comparatively small value in sugar.

The following tables contain a statement of the crops of 1897-98 and 1898-99 and of the value of the water applied by irrigation. A brief table is first given showing the average weight of cane and yields of sugar for the two seasons:

YIELD OF CANE AND SUGAR AT HAWAIIAN EXPERIMENT STATION.

Crop period.	Number of tests.	Yield of cane per acre.	Yield of sugar per acre.
		Pounds.	Pounds.
1897-98	20	166,562	24,755
1898-99	15	192,440	27,133

These are the results in cane and sugar per acre of crops that were about nineteen months on the ground and subject to systematic irrigation for seventeen months.

The relation of the crops to the total volume of water received both as rainfall and by irrigation is as follows:

WATER REQUIRED TO PRODUCE 1 POUND OF SUGAR.

Crop period.	Rainfall.	Irrigation	Water per acre.	Yield of sugar per acre.	Water required to produce 1 pound of sugar.
	Inches.	Inches.	Gallons.	Pounds.	Pounds.
1897-98	46.56	48	2,567,682	24,755	865
1898-99	26.01	77	2,797,133	27,133	859

The volumes of water consumed by the cane per pound of sugar made during the growth of the two crops are very nearly the same. During the growth of the crop of 1897-98 some of the rainfall occurred in heavy precipitations, and it was ascertained that water escaped through the subsoil and was lost. During the production of the crop of 1898-99 none of the water received, either from rainfall or from irrigation, was lost in this manner. No single rainfall exceeded 1 inch, and in irrigating no more than 1 inch of water was applied at any single watering.

It is seen from the preceding tables that the maximum quantity of water applied artifically during a season of extreme drought was 77 inches during a period of seventeen months, or 2,090,858 gallons of water per acre, to make a crop containing 27,133 pounds of pure sugar

per acre. These results are the average of fifteen tests, which were made under identical conditions of soil, cultivation, and fertilization.

The following table brings together the estimates of the duty of water in the Hawaiian Islands contained in the report of Schuyler and Allardt, previously referred to, and the results of experiments made at the Hawaiian Experiment Station by the writer:

DUTY OF WATER IN HAWAIIAN ISLANDS.

	Water applied per acre per crop.		Yield of sugar per acre.	Water required to produce 1 pound of sugar.
	Depth.	Quantity.		
According to Schuyler and Allardt:	Inches.	Gallons.	Pounds.	Pounds.
Spreckelsville (1)	262.00	7,114,348	11,100	5,345
Spreckelsville (2)	216.00	5,865,264	11,100	4,407
Hamakuopoko	230 20	6,250,850	11,300	4,613
Kekaha	198.20	5,381,428	12,000	3,740
At the experiment station:				
First crop (1897-98)	94.56	2,567,682	24,755	865
Second crop (1898-99)	103.01	2,797,133	27,133	859

In the above table the yields of sugar per acre as given are higher than stated by the plantation authorities. For Spreckelsville the yields as stated were "for plant cane, 5.75 tons of sugar per acre; the ratoon crop, 3¼ tons per acre;" for Hamakuapoko, "5.6 tons of sugar per acre for plant cane and 4 tons for ratoon crops," and for ratoon crops at Kekaha "5 tons of sugar per acre for seven years." These figures express the amounts of sugar per acre obtained by the mills and marketed, and not the full amounts produced by the soil. As a correction, and to make the figures comparable with the statement of experiment station yields, 20 per cent has been added to the amounts given by the plantations. This may be rather too much, but it has to be remembered that the mills ten years ago did not obtain as much sugar from the cane as they do to-day. However, the figures of yield as given are probably a little in favor of the plantation.

In comparing the data contained in the table it is again to be remembered that the figures furnished by the plantations state what was actually being done by those plantations. The experiment-station data show what has been done and what it is possible to do, where the irrigation is carried out according to scientific principles and where the conditions are under control. Upon a large plantation the conditions can not be controlled to the same extent as is possible with experiments on limited areas. This in no wise lessens the force of the fact that plantations are wasting huge volumes of water in their practice of irrigation or removes the necessity of examining into and determining the location and causes of the waste.

The figures contained in the last column of the table show the pounds of water received from rainfall and irrigation per pound of

sugar grown. Instead of using sugar as the standard we may use the total dry substance of the crops in its relation to the water received per acre. The exact data furnished by the station's experiments enable this to be done:

WATER USED TO PRODUCE 1 POUND OF DRY SUBSTANCE.

Crop period.	Water received per acre.	Dry substance produced per acre.	Water required to produce 1 lb of dry substance.
	Pounds.	Pounds	Pounds.
1897-98	21,414,457	98,725	216
1898-99	23,328,089	110,087	212

By "dry substance produced per acre" is meant the total amounts of water-free cane and leaves produced by 1 acre of ground. During the crop period 1897-98 some rainfall water was lost by percolation through the subsoil, but how much was not ascertained. During the growth of the crop of 1898-99 no water was lost. Two hundred and twelve pounds of water were used, therefore to produce a pound of dry substance.

The most fertile plantation upon the Hawaiian Islands last year yielded 20,500 pounds of sugar per acre, and according to the estimate of the manager, consumed a little over 5,000,000 gallons of water per acre. On this plantation a less volume of water propuced double the quantity of sugar that was obtained at Spreckelsville and Hamakuapoko; consequently the waste of water at those places must have been great. Upon this fertile plantation, however, there are ample evidences of past excessive irrigation and waste. The volume of water used per acre was double that used at the experiment station to produce less sugar per acre.

A small crop of say 30 tons of cane or 4 tons of sugar per acre can not in its growth consume the volume of water demanded by a crop of 80 tons of cane or 10 tons of sugar per acre. It can consume only a fixed portion of that volume. The same principle applies in the demands made upon the soil for plant food. The large crop absorbs more of the soil constituents to compose its substance and promote its growth. Water is only one of the essential factors which control the size of the cane or other crop. The depth and fertility of the soil, the fertilizing elements supplied, and the extent of cultivation are all potent factors affecting production. It has already been shown in a previous paragraph that the growth of the cane and the amount of water used during increased growth, as indicated by the increased transpiration of water by the cane, are very noticeably influenced by the action of nitrogenous fertilizers.

DISTRIBUTION OF WATER.

In the Hawaiian Islands sugar cane is irrigated exclusively by ditches and forrows. In laying out a field to be planted in sugar cane the first step is to make a survey of the area and to determine its con-

tour. The notes of the survey will show the direction in which the cane furrows shall be constructed and also show where the laterals which feed the furrows should be located. On uneven ground the furrows are curved in order that the grade may be kept uniform.

If a field is practically level—and there are vast areas of relatively level land in locations where cane sugar is likely to be grown—the furrows are dug straight through the field. The most level field, however, usually has a dominant decline in some direction which is usually determined by the general formation of the lands of the region. The Hawaiian Islands are of volcanic origin, and hence the general slope of the land is from the craters to the sea. The country is mountainous in the neighborhood of the volcanoes. The slopes become flatter as lower levels are reached, until the decline apparently disappears in the lands bordering on the seacoast. The latter have

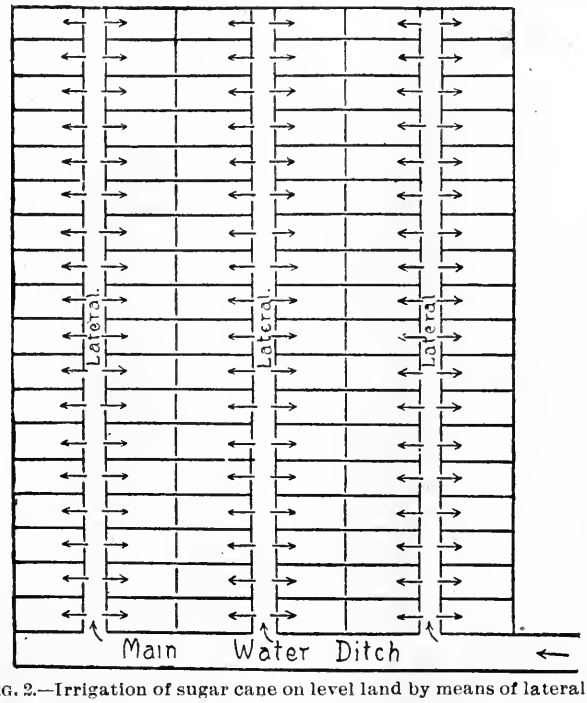


FIG. 2.—Irrigation of sugar cane on level land by means of laterals.

been deposited by streams running from higher lands. In spite of the flat appearance of these lowlands they generally have a decline toward the sea which is not only sufficient to make the distribution of water a simple matter, but also to effect the discharge of underground water. This, however, is not always the case, the writer having several tracts in mind where the ground water can not find a discharge owing to its service being but slightly above the level of high tide.

The diagram (fig. 2) shows a field that is furrowed for planting and has subditches dug for the distribution of water. The furrows are made at right angles to the fall of the land and the distributing laterals are constructed at right angles to the furrows, or parallel with the natural water flow.

As the diagram shows, the main ditch feeds the laterals and these feed the furrows. The laterals discharge into the furrows on each side, the water flowing one-half of the distance between laterals in each direction. The furrows in the diagram are between the rows of cane. In the Hawaiian Islands the cane is generally planted and kept in furrows and not ridged up, and the water is applied in those furrows, running in and out around the cane stalks. In other countries visited by the writer, where irrigation is required during a part of the growing season, the cane is more generally upon the ridge and the water is applied between the rows of the cane, as shown by the diagram. The practice is controlled by such factors as the nature of the soil, the rainfall at specific seasons, and the related questions of drainage.

In the diagram (fig. 2,) the lines indicating the rows of cane are assumed to be 5 feet apart, which is the usual distance. In some situations, owing to local causes, the distance between the cane rows may be as much as 6 feet or as little as 4½ feet. The distance between the laterals is assumed to be 30 feet, which means that the water is intended to flow only 15 feet from each side of the laterals that are feeding the furrows. The lines running midway between but parallel with the laterals represent earth dams in the furrows. These limit the length of flow of the water from the laterals on each side. Only lands having a very even surface can be laid out upon the simple plan of the diagram.

Before speaking in detail of the methods of applying water, one other system will be described. This provides for the direct discharge of the water from the main ditch into the furrows. The system (fig. 3) has been observed by the writer, its results considered, and it is mentioned chiefly to show its essential defects.

In the system illustrated in this diagram (fig. 3,) the water supply is from a main ditch of considerable size (a width of 5 to 8 feet has been observed,) which feeds the water furrows between the rows of cane direct, as illustrated by the arrows in the diagram. The cane rows are drawn straight through the field. The water flows parallel with the rows of cane and not at right angles to them, as shown in diagram (fig. 2.) Consequently the water has to distribute itself by flowing from the main ditch to the opposite end of the field. As already remarked, this system of distribution is exemplified in order to make clear its very palpable drawbacks, which will be briefly explained.

Volume of the application.—Schuyler and Allardt, in treating of this subject under the conditions of the Hawaiian Islands, state that "it seems to be generally understood by all planters that the depth of each watering, i. e., the volume of each application, shall be at the least an average of 3 to 4 inches over the whole surface of the ground." The same authors quote one of their witnesses as saying "11,000 cubic feet per acre every seven days will produce the very best results in growing sugar cane." That volume is equal to 3⅛ inches of water over the whole ground per weekly application. Another example from the same authority gives "10,890 cubic feet per acre to each watering every seven days." This volume is equal to an application of 3 inches of water over the whole ground once a week. When the small rainfall was added to the amounts applied by irrigation upon the

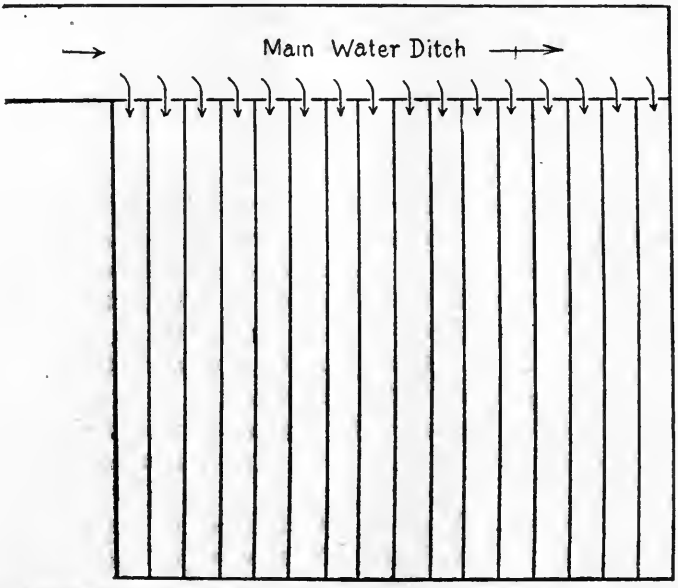


FIG. 3.—Irrigation of sugar cane on level land by direct discharge of the water from the main ditch into the furrows.

plantation spoken of by Schuyler and Allardt, then the average application per seven days over the stated period of fifteen months or sixty-five weeks appeared as follows:

DEPTH OF WATER APPLIED TO SUGAR CANE DURING SIXTY-FIVE WEEKS (RAIN FALL AND IRRIGATION).

Plantation.	Water applied per acre.	Mean application per week.
	Inches.	Inches.
Specklesville (1)	262.0	4.03
Specklesville (2)	216.0	3.32
Hamakuapoko	230.2	3.54
Kekaha	198.2	3.05

The figures in the outer column indicate the average depth of application per week during the growth of the crop, which is given as sixty-five weeks. Concerning the value placed upon the rainfall, Schuyler and Allardt say, "the rain may at times exceed the quantity applied artifically, but irrigation is performed the same as usual, notwithstanding, in order that there shall be no break in the continuity of the waterings."

HOW I WILL CONQUER THE NILE.

By Sir John Aird, Engineer-in-Chief.

Within a short time "the uprising of the Nile," the yearly overflow which from time immemorial has inundated the country bordering on the patriarch of rivers, will be a thing of the past. Modern engineering skill has overthrown nature and the tradition of centuries, and in the future, no matter how great the freshets of water, the Nile will never flood its banks; two great dams, Assuan and Assiut, stand as impregnable barriers.

The damming of the Nile, now successfully approaching completion, is one of the most stupendous engineering feats of modern times. So far over twenty millions of dollars have been expended in pushing the work, and fully five millions more will be needed to complete it. An army of workmen representing all nationalities has been busily engaged, and like magic a city has sprung up at the site of the operation. It is difficult to convey a clear conception of the magnitude of the work. It must be seen to be appreciated in its immensity.

Thousands of workmen are busily engaged making mortar, moving the blocks of granite or placing them in their proper positions. Steam engines are continually passing along the line of railway, which covers ten miles, bringing men and materials. Steam cranes and travelling trolleys are hard at work in every direction; and a feeling of admiration comes over one at sight of this toiling mass of humanity, so perfectly drilled and directed that by no chance does one man interfere with or retard the work of another. It seems like one huge loom working out some great piece of tapestry, which is gradually approaching its completion. Scotchmen are very numerous at the barrage, as somehow they always are in undertakings of this kind in all parts of the world, their sterling qualities being especially valuable when dealing with native races.

A great army of masons is constantly busy cutting and dressing the blocks, each one of which is measured and surveyed by competent inspectors, who initial it before it is passed as fit to be used. In the early days expensive machinery was sent out from England to expedite the cutting of these blocks, but it was subsequently found that the old way of splitting the stone by means of wedges was, after all, the best and easiest, and a great deal of the machinery has not even been unpacked. Our best masons are Italians, but there are mechanics of many nationalities, all working together in perfect accord.

In the matter of stone we were very fortunate; in fact, but for a great piece of luck the work would not be anywhere near completion

and would have cost a great additional sum. I refer to the find of our granite right here in the bed and along the banks of the river. I had calculated on having to ship the greatest part of the material for stonework. I was aware that a certain kind of granite was to be found in this vicinity, but did not believe that it would be hard enough or of sufficiently good quality to be available. When we commenced excavating there were unearthed what apparently seemed inexhaustible quarries of as fine a granite as could be found anywhere on the globe. This saving in time and money can scarcely be overestimated; for not only is high-quality granite expensive, but the difficulty of transportation would have entailed enormous outlay, not to speak of irritating and expensive delays while waiting for material.

The total extent of the dam is one mile and a quarter, of which one mile and an eighth of the foundation is finished. Temporary dams, enabling the remaining section to be put in, are now carried across the channel. Pumps for getting in the permanent dam foundations will be started immediately. The whole of the granite masonry required for the dam is cut and ready to be laid in place. The parapet alone remains to be prepared. The portion of the dam remaining to be built is that across the well-known western channel. This will be the most difficult part of the entire work, but, profiting by experiences gained thus far, I feel confident that I can cope with any problem that may arise.

The first great difficulties to contend with were those connected with the foundations of the dam. Although advantage was taken of the numerous large rocks stretching across the river, it was found that between them were serious faults or fissures, in which it was necessary to go down great distances before arriving at a sound bottom. Speaking generally, in many places the depth of the foundations amounts to twice the height of the superstructure. The foundations have now been completed to within a distance of about a hundred and fifty yards of the west bank. Each portion of the bed of the river has had to be dammed and cleared of water before the work could proceed, in order that it should be perfectly sound and lasting. This has, of course, caused an immense amount of labor.

There are altogether one hundred and eighty sluices. On the shore ends these are in a double tier, but they are single in the central portion. These will, of course, be opened and shut by hydraulic power. The upper sluices are not carried to the actual top of the dam, which would thereby be weakend, but are openings in the work with a continuous line of masonry above them. The locks are to be erected on the west or uncompleted side, and will be of immense strength and adequate capacity. Many of the sluices where the pres

sure is expected to be greatest are lined with iron frames, the castings of which have come from Glasgow and Ipswich.

The height of the structure from low Nile level will be about sixty feet, and the slope of the stonework on the down side will be two yards in every three, in order to meet the enormous pressure of the water. On the upper side it will be nearly perpendicular. You can readily understand these precautions to secure strength, when you hear that there will be times when the dam will be called upon to withstand the tremendous pressure of a discharge of fifteen thousand tons of water per second. Such an overwhelming avalanche would sweep away like chaff an ordinary structure. The dam will control the great river for one hundred and forty miles.

At Assiut the giant regulating dam across the Nile approaches completion, the foundation being practically all in position, leaving a portion of the superstructure to be completed. The sluice openings here number one hundred and nineteen, all sixteen feet wide. This dam is somewhat similar in principle to the well-known barrage near Cairo, but the details of construction are entirely different, as the foundations are guarded against undermining by a complete line of cast iron and steel piling above and below the work. The barrage itself is constructed of high-class masonry, instead of brick-work as at the old barrage.

As a supplementary work to the reservoirs-dam is the new head-work to the Ibramieh Canal, consisting of a regulation of sluices and a lock. To permit of the commencement of this, a division channel has had to be constructed for the Ibramieh Canal, where four to five thousand men are engaged in cutting. The work here is now practically completed.

The greatest source of delay with which we have to contend has been the annual flood of the Nile. This suspends the work from three to four months, during which everything is covered with water. As this recedes repairs have to be done to any damage which may have been effected; but with the exception of some of the rails being displaced and a few timber balks being washed away, very little harm is done, and that little is very speedily rectified, and the work renewed with fresh vigor at the point where it had to be abandoned.

Our army of employees, ranging from skilled engineers, whose salaries run into thousands, down to the humble laborer who makes four shillings per day, during their long stay have built up quite a little city at Assouan. Every effort has been made to further their comfort. Habitable barracks have been erected, and airy dwellings built for the large staff. A hospital has been fitted up, attended to by two doctors, with all the necessary assistants and appliances. In works of this character accidents are occasionally unavoidable, and

every provision has been made for their immediate and skilful treatment. There is also a building set apart for infectious cases, such as small-pox, where the patients are separated at once from the other work-people and thus the risk of contagion is avoided. A club has also been started for general recreation, and some highly successful entertainments have been greatly assisted by voluntary performers from among the visitors at Assouan.

THE NATIONAL GOVERNMENT SHOULD AID IRRIGATION.

A meeting was held by the members of the Chamber of Commerce and Real Estate Exchange of Denver, Col., May 29th, to listen to an address by George H. Maxwell, executive chairman of the National Irrigation Association.

Mr. Maxwell said that what he wished to urge more than anything else was that the business men of the West should act together. If they did not, there would nothing more come of any movement than came of the one started ten years ago, when nothing was done.

"Congress," said Mr. Maxwell, "ten years ago appropriated $10,000 for the making of surveys and the beginning of the work. The plan fell down and went to pieces for no other reason than that the business men of the country, the men who had the most to gain, never came together, and allowed the whole thing to be destroyed by persons who had special interests.

The whole problem, Mr. Maxwell said, he found to be one of organization. If the business men of the entire West, not of one State or one locality alone, should agree on a proposition, and take care that it should be a sound one, when they should all pull together the force would be irresistible. The irrigation problem had passed beyond the stage where private enterprise or even State aid would be of avail. There was only one resource and that was to have the national government take it in hand. It was too large to be handled by any other power or authority.

"Suppose," said Mr. Maxwell, "that you could wake up to-morrow morning with the positive knowledge that this country was entirely changed and was a humid one. There would be such a rush to take up the lands of the State that in ten years Denver would be a city of more than a million population. Well, by bringing all interests together, as it now is, you can put twice the population on those lands. The result we want to accomplish is to put as much population as we can on the arid lands of the West. It is hopeless to try to get it done by private capital. The work must be on so vast a scale that returns

cannot be expected in a time that will make it a profitable investment. Where systems can be built by settlers they have been built. The Carey land act is a failure because the people of the West do not see how it is possible to reclaim the lands by it. The law to make irrigation districts and issue bonds on uncultivated land has been tried and has failed. There is no recourse or resource except the national treasury. If anyone brings up an objection to the national proposition, ask them to present a better.

"Draw a line through the center of the United States and the whole country west of it, excepting only a narrow strip along the Pacific coast, is an arid region where irrigation is needed. Denver is the hub of this wheel. It is the center of the region, which has one-tenth or less of the population of the United States. If the national irrigation policy is carried out this territory would have more population than all the United States has now. We can double the population of the West in five years, and the East would never miss a man, woman or child."

Mr. Maxwell urged unity of action, stating that there could be nothing done unless there was absolute harmony and unity. No national law, he said, would ever interfere with the present manner of distributing water under the laws of the State or with any existing water rights. There was no sentiment in the East, he added, against any equitable manner of storing and distributing water. There was objection to any plan that would place the stored water in the hands of large companies and not in those of actual settlers. It might be neeessary in some districts for the Government to store water and assist in the construction of the canals to carry it to places where it could be placed in the hands of actual settlers.

"This is what we are asking for," said Mr. Maxwell. "First, an appropriation of $250,000 every year for surveying and laying out the work, selection of sites and preparations for giving water to actual settlers. Second, a direct appropriation in the river and harbor bill to build reservoirs, just as they have been built on the headwaters of the Mississippi. Third, that where the government builds these reservoirs they shall not conflict with any vested rights."

Mr. Maxwell paid his compliments to Representative Mondell of Wyoming, claiming that the gentleman had opposed every effort made to reserve public lands for actual settlers. The only bill that was put through Congress was, Mr. Maxwell stated, pushed through by eastern men on the House committee. They saw that it would benefit the country, and for that reason they were in its favor. In conclusion, the speaker assured the gentlemen present that, if they should adopt a plan favoring settlers and not large cattle and other companies, the eastern Congressmen would aid them in every way possible.

CONVICTS FOR ARID LANDS.

SENATOR DIETRICH OF NEBRASKA HAS A UNIQUE IRRIGATION SCHEME.

An open letter to His Excellency, Ex-Governor of Nebraska, Hon. C. H. Deitrich, now U. S. Senator.

LINCOLN, NEB.

Gov. Deitrich, Dear Sir.

I read with great pleasure and approval your late invaluable article on the subject of "Irrigation of our arid lands of the west" as it appeared in the *Kansas City Star*; and as a co-worker in the common cause of the best interests of humanity and philanthrophy, I take great pleasure in expressing to you and the world at large my appreciation of your zeal in this the greatest enterprise that is before the American people, and I take great pleasure in reproducing it for the benefit of other readers through the pages of that invaluable medium of exchange of thought, the "IRRIGATION AGE," published at Chicago by that prince of good fellows, Hon. J. E. Forrest.

And we here submit your article in full:

"In the next Congress an effort will be made to place all penitentiaries under federal control and utilize the energies of all, except the most desperate criminals, in the contruction of irrigating trenches and reservoirs for the reclamation of the arid districts in the West. Senator C. H. Dietrich of Nebraska is the sponsor of the scheme and is now preparing a bill which he will introduce into the next Congress to bring about the desired change.

"Recently a conference of congressional members from several states with arid lands was held in Omaha. Senator Dietrich gave a brief outline of his scheme and the congressmen who were present pledged support to the measure. As a result of the meeting Senator Deitrich hastened to Washington to begin work on the bill. He will have the hearty support of the Nebraska delegation, regardless of party affiliations, and they will try to secure additional aid from the representatives from the other arid states.

"Senator Dietrich proposes to divide the United States into districts, in each one of which a federal prison will be maintained. To the federal prisons all convicts will be sent. The authorities at each penitentiary will be required to select all orderly, well behaved convicts for labor in the arid regions. These men are to be provided with citizens' clothing and taken to the scene of their labors, where they will be treated as ordinary workmen. Good conduct, and according

to the plans of Senator Dietrich, greatly shorten the length of the original sentence. Besides, the prisoners will be allowed a fair monthly sum for their services and the total amount will be given them when they are discharged. In this way the task of redeeming the barren lands in the Western states could be cheaply and economically done by men who are now pining in confinement. A vast increase in wealth would result, contends the senator. The convict would be greatly benefited because the pure air, wholesome food and interesting labor would make his surroundings more cheerful. The demoralizing atmosphere of the prison would be counteracted. Short term men and those whose criminal instincts are not prominently developed could labor together and the worst feature of prison life, the dissemination of evil desires, would be eliminated.

HOW HE WOULD EMPLOY SOLDIERS.

"To guard the prisoners, the idle troops and cavalry squads could be pressed into service. The district in which the convicts labor, according to the plan of Senator Dietrich, could be guarded by a strong picket line of soldiers. The latter would rarely come in contact with the convicts and would, he says, receive valuable training in scouting. In camp a detailed record of the delinquencies of the convicts could be kept. For pardons, good prison records would be absolutely indispensable. Senator Dietrich is confident that by this method insurrection would be unheard of and attempts to escape would be made rarely.

"Civil engineers and government experts are relied on by the senator to outline and direct the work. By careful selection the convicts would be sufficiently skilled to perform all of the labor required. He has devised no method for determining in what section of the country the work would be done, intrusting that feature to the government's civil engineering department.

"Senator Deitrich was first prompted to devise the scheme on humanitarian grounds. Twenty-five years ago he was working as a day laborer in the swamps of Arkansas and Mississippi. At that time the convict camp, with all its terrors, was in vogue. The prisoners were compelled to do the most exhausting labor on a diet of bacon, cornbread and river water, with only a few hours devoted to sleep and rest. Nearly all the convicts wore the ball and chain. The inhuman treatment and loss of energy, as well as the unsanitary conditions, vividly impressed the future senator. From that time until the present he has never ceased to meditate on a plan for improving prison conditions.

HE'S AGAINST PRISON WALLS.

'According to his theory, confinement within prison walls detract

from the strength of mind and body. The moral atmosphere is tainted and cantaminating. There is no distinction made between the most debased criminal and the man who erred through the strenuous pressure of unfortunate circumstances. He claims that out of the 33,000 criminals in the United States, 25,000 are detained within the prison walls on account of the defects of the present system. In prison the convict is frequently employed in time-killing drudgery, argues the senator. His labor benefits neither himself nor the state. When the prisoner is released, mind and body are both weakened by confinement. Reproach and contempt follow as a matter of course. Under such circumstances there is no chance for the discharged prisoner who wants to lead an honest life. He cannot make a living in competition with his fellows. Vagrancy and fresh crimes are the inevitable results.

"By labor, in the arid regions, the convicts could work in the open air. Their surroundings would be the most healthful. The labor, insists the senator, would be pleasant and less onerous than in the prison. In the continual change of scene, the men would forget the past and no longer brood over their mistakes or plot revenge. It would induce them to forget their condition and the wages paid would be of assistance when the day of assistance when the day of discharge came."

Knowing you as I do, Dear Governor, I am not surprised at your originating this novel and humanitarian plan of constructing this grand work, at the same time relieving so much mental as well as the physical sufferings of that unfortunate class of our people, viz, the criminal and convicts of our prisons; but, Dear Governor, will you pardon me for a kindly criticism of a few sections of your article, and consider the substitutes I may suggest as they appear more practical to me.

For forty years I have advocated the idea and it being the duty of the general government to construct the reservoirs and main canals to furnish or supply the water for this purpose of reclaiming these arid lands of the west, and providing homes for 100,000,000 people where now but a few thousand exist.

Nine years ago I advocated this principle in the National Irrigation Convention, and have since, but never until at our very zealous and harmonious session at Chicago last winter did this plan meet with general favor, and at that session after brief discussion by delegates from Massachusetts, California, Arizona and North Dakota and near all the intermediate states and territories this method was adopted and President McKinley was memorialized to lay the matter before Congress, asking for an appropriation to begin the work.

Now, Dear Sir, you propose to have this work done as far as may

be practical by convict labor, taking them from the federal prisons, clothing them in citizens' garb, and guarding them with soldiers to keep them at work and guard against insurruction and escape, and to pay them for their labor, while this savors nicely of a humanitarian spirit, and the writer would not discourage it, could he see it to be feasible, but, dear sir, after a familiar acquaintance of twenty-five years with the character of convicts in our Nebraska penitentiary, we are of the opinion that it would require at least two mounted and armed soldiers to watch one average convict during the day and at night I fear three-fourths of them would escape taking the soldiers' horses with them.

Again, dear Governor, bear in mind there are thousands of loyal and good men and women, too, that have never violated the laws of the land and brought down upon themselves the condemnation of law, if any class are to be favored why not these honest and industrious toilers of the West that have for years struggled against adversity to reclaim this arid country and make for themselves homes, while the convicts have stolen their horses and cattle by day and night. Let these do the work for pay.

"Prison walls are demoralizing," you say, to which we respond a most hearty amen! So, too, Governor, are the environments of the average homesteader on the plains struggling for an existence for his family, and to see his crops fail year after year for want of water. Your humble servant gave five years of the best of his life's efforts to improving a farm of 1,500 acres in western Nebraska near twenty years ago. We started a settlement twenty miles from a post-office or blacksmith shop, hired money of an Eastern loan company to make our improvements. In five years we had four timber claims improved, 300 acres nicely cultivated, 2,000 fruit trees planted and dead for want of water, the best buildings in the county, a new county organized, Perkins, a railroad, the B. & M., running through our land, a county seat town, Grant, but a half mile from our land; the loan company had all our land but 320 acres (and they were insolvent), and we gave up the struggle of endeavoring to succeed in agriculture under a shortage or insufficiency of water; we left the premises of as fertile land as the best in Illinois or Iowa, the purest and best air and delightful climate with far more experience than we took there and $5,000 less money—a wiser, if a sadder man; and ours was the experience of thousands of as industrious and worthy men and women as can be found anywhere. And, dear Governor, "We love that country so, is why we hate her faults," lack of water only, and though we may never be allowed the privilege, duty, or pleasure of another effort at redeeming as we once tried by the toil of our hands and the sweat of our brow, we feel with you it is a commendable enterprise in which to

do our best by pen and voice and prayer, and sir should we succeed, generations yet unborn will rise up and call us blessed.

In the August issue of IRRIGATION AGE I will endeavor to show why Col. A. Hoagland's patented steel canal or flume should be adopted for this work in lieu of a dug canal. Meantime I am, sir, in all good works and deeds,

Yours very truly,
C. B. PARKER.

A DIPLOMAT.

You have heard the tale, perchance,
How an ancient King of France
Of his baker made a minister of state;
For his majesty, 'tis said,
Liked a certain kind of bread,
Which no baker in the land could duplicate.

But one day he took a bite,
When upon his royal sight
Burst an insect they had baked into the bread;
Cried the monarch, "Ha, a roach!
Bid the pastry cook approach,
He shall answer for this outrage with His head."

When the baker viewed the bug,
He made answer with a shrug:
"Tis a rasin, sire I put into the food."
Then he praised its luscious taste,
And he swallowed it with haste,
And he smacked his lips as though he thought it good.

And the monarch, reconciled,
To his courtiers turned and smiled,
"I confess," he cried, "at length I've found my mate.
Such a diplomatic head
Shouldn't waste time baking bread".
So he forthwith made him minister of state.

—*Milton Goldsmith in Harlem Life.*

THE DIVERSIFIED FARM.

In diversified farming by irrigation lies the salvation of agriculture.

SUGAR BEETS.

Extracts from Bulletin 63 Experiment Station, Colorado:

Mr. Frank Watrous, in charge of the substation at Rockyford, grew beets in 1890, '91, and '92, and records the results of his experiments in bulletin No. 21. The season of 1890 was spent in groping after facts, and the product, though encouraging, was not large. The yield obtained ranged from eight to seventeen tons per acre. Some of these yields were from half acre plots, others estimated from single rows.

In 1891 an experiment in irrigating beets was made, from which Mr. Watrous concludes that, in an ordinary season, one irrigation during the growing season is sufficient to produce the best results both as to tonnage per acre and saccharine matter contained. Four plots of one-fourth acre each were planted to Vilmorin beets. Plot 1 was not irrigated; plot 2 was irrigated once; plot 3 was irrigated twice; and plot 4 was irrigated three times. The dates of irrigation are not given. The results are:

Plot 1. Yield: 9 tons per acre. Sugar: 14.25 per cent. Purity: 80.5 per cent.

Plot 2. Yield: 10.8 tons per acre. Sugar: 15.2 per cent. Purity: 84.3 per cent.

Plot 3. Yield: 9.9 tons per acre. Sugar: 14.22 per cent. Purity; 79.5 per cent.

Plot 4. Yield: 9.9 tons per acre. Sugar: 13.0 per cent. Purity: 76.0 per cent.

In 1892 the plots were 1-1000 and $\frac{3}{4}$ acre each, four of the sixteen plots being $\frac{1}{4}$ acre each, four of the sixteen plots being $\frac{1}{4}$ acre in area. The yields from the $\frac{1}{4}$ acre plots were 18 7 tons, 20.5 tons, 25.0 tons, and 25.7 tons per acre, and the sugar percentage 15.18, 16.7, 15.9, and 18.9. The coefficient of purity was between 82 and 85. The yield from the 1-100 acre plots was somewhat higher, as was to be expected, the sugar content ranging from 13 to 15.8 per cent, and the coefficient of purity from 76 to 85.

The plan of culture adopted as the result of the three years study is as follows: After land had been plowed, harrowed, and made quite smooth, even, and free from lumps, stones, or trash, seed was sown with an ordinary hand drill, sowing eighteen pounds to the acre, covering an inch or less in depth, in double rows one foot apart, separated by a space two feet wide. Then, with one horse and a shovel plow, a trench was made in this space, the dirt being thrown on both sides to finish covering the seed. The rows are worked over quickly with a rake or hoe, and the seeding is complete. Beet seed requires considerable moisture to produce germination, hence, in a dry spring, water may be turned in these ditches and beets brought forward, independent of dry weather.

To facilitate irrigation, rows should not be more than three hundred feet in length, preferably less. It should not be necessary to drench the upper end in order to moisten the lower end.

Proper cultivation consists in hand hoeing or working with a fine-toothed cultivator, the surface of the ground being stirred as soon after irrigation as practicable. From experience at this Station it seems safe to state that the more careful cultiva-

tion, with the proper amount of water when needed, the more sugar per acre.

Bulletin No 36 discusses the general outlook for the sugar industry in Colorado. The question of market for the sugar which might be produced in the State is answered as follows: "To produce the sugar consumed by the inhabitants of Colorado would require five factories of large size, employing two hundred men each, who with their families, would represent about four thousand people. It would require the growing of sugar beets on fifteen thousand acres of land, and add more than three hundred dollars to the income of each of two thousand farms."

Touching the question of profit, the writer says: "If prices are such as to make the business profitable anywhere, then it will pay in Colorado."

The irrigable portions of Colorado below 5000 feet in altitude and east of the Rocky Mountains, possess the best possible climate for the growth of sugar beets, as do many of the valleys of the western portion of the State, but the parks of Colorado are too cold for the sugar beet to be grown with profit.

The common cause of failure among beginners is a lack of thorough preparation of the soil. The plowing should be done in the fall, subsoiling to fifteen or eighteen inches. If this is done, a thorough harrowing just before planting will be all that is needed.

If the plowing is done in the spring it should be delayed until just before planting. The planting is done with a drill. An ordinary wheat drill may be used, but there are special drills for planting beets. Twenty-four inches is recommended as the distance between rows, being none too far apart for irrigation.

The quantity of seed recommended to be sown is at the rate of twenty pounds to the acre. This quantity is large, but advisable in order to get a full stand. The seed should be put in about an inch and a half deep. If the ground is thoroughly wet at the time of planting half an inch may suffice.

If the plowing is done in the spring it may be advisable to irrigate the ground thoroughly before plowing, and thus insure a good supply of moisture in the subsoil.

If, after the seed is sown, the weather is so dry that the seed has to be "irrigated up," the chances of a profitable crop are slight. The seed can be successfully "irrigated up" by running a furrow six inches from the drill and allowing a small head of water to run until it has wet the seed by soaking sideways.

The planting may be done from the last of March till the middle of June. Sugar beets sown the first of May will be ready for harvesting about the first of October.

The first cultivation should take place as soon as the plants are up enough to enable one to follow the row. Whatever implement is used, it should merely scratch the surface of the ground, leaving it level and killing the small weeds without throwing dirt onto the young plants. The weeds must be kept down. The ground should be cultivated after each irrigation to level the ground and make a dirt mulch on top to preserve the moisture.

The beet crop in Colorado will need one, and possibly two or three, irrigations. The last irrigation should be given about six weeks before the crop is mature. In 1895 a heavy rain in September kept the beet crop in full growth, until frost, and produced a crop with much less than the usual amount of sugar.

The plants should be thinned when they have four leaves, leaving but one plant in a place. The distance between plants should be eight to ten inches. There is generally but little difference in the weight of the crop in cases where the beets stand six, eight, and ten inches apart. It is easy to grow beets weighing five pounds each, where the soil is rich, by thinning to twelve inches, but such beets are inferior

to beets averaging less than two pounds for sugar, and also for stock feeding.

In thinning, the plants are cut out by means of a sharp hoe, leaving bunches of a few plants each, which must be thinned to a single plant by hand.

The soil of Colorado is generally rich enough to grow several crops of beets without fertilizing, but it must eventually be fertilized in order to maintain the yield.

In case alfalfa ground is broken up beets should not be grown on it the first season, but rather a crop of wheat. This will put the soil in better condition and will rot the alfalfa roots. It is not advisable to grow beets more than two years in succession on the same ground. Alkali ground may be an exception.

If barnyard manure is used to fertilize he soil, the beets can advantageously follow a crop of corn.

The best varieties are the Kleinwanslebener and Vilmorin.

The harvesting is done either by means of a beet puller or by plowing a furrow near the beets and pulling them by hand.

The topping is done by means of a heavy knife. Topping machines have, as yet, not been successful.

The factories work on beets hauled directly from the field up to the time freezing weather sets in. Beets to be used in the latter part of the season should be protected from freezing; for this purpose they may be put into shallow pits and covered with straw and dirt, either near the factory in pits provided by them, or in the field.

The cost of growing an acre of beets varies in different parts of the country, the size of area planted, the condition of the ground, etc. The range is from thirty to forty-five dollars, or from two to four dollars per ton.

About eleven tons of sugar beets per acre at four and a half dollars per ton is a fair average crop, with a possibility of a much larger yield. Compared with alfalfa or wheat, the return seems large, but much more labor is required to produce it.

Sugar beets have a high value for stock feeding. They have been fed at the College with good results, except where fed to steers. The beets seem to be too watery for profitable feeding to steers where the feeding is done out of doors in cold weather. It is advisable not to feed them to fattening lambs for the last six weeks before marketing, grain being preferable at this period, so that the flesh and fat may harden for shipment.

The tops are good feed for all classes of farm animals. They may be fed at once, as soon as harvested, or put in a silo and fed through the winter.

The next record of results occurs in bulletin No. 42. In 1897 we made an effort to enlist persons in different parts of the State in the raising of sugar beets. The Station has already established beyond any doubt the adaptability of both the soil and climate of this section of the State to the cultivation of the sugar beet, and also of that of the Arkansas valley, where the substation at Rockyford is located, but no cooperative work, including all sections of the State, had been entered upon. The Station received from the Department of Agriculture at Washington, five hundred pounds of beet seed, and from A. Keilholz, Quedlinburg, Germany, two hundred pounds. This seed was sent to six hundred and eleven persons residing in forty-seven counties of the State. Most of the analyses of these beets were made by the Department of Agriculture in Washington. The State was divided into five sections, as follows:

1. The valley of the South Platte and its tributaries
2. The Divide south of Denver, where crops are raised without irrigation.
3. The valley of the Arkansas.
4. The valley of the Grand.
5. The San Luis valley.

The varieties used were the Kleinwan-

zlebener, Vilmorin, and the Imperial White. As there were one hundred and six samples of the Kleinwanzlebener variety out of the one hundred and twenty-five recorded, no distinction is made between the varieties in this summary.

The percentage of sugar in the samples from the Platte valley ranged from 11.5 to 20.0, the coefficient of purity from 73 to 86, and the orop in tons from 9 to 47.

The percentage of sugar in the samples from the Divide section, growth without irrigation, ranged from 11 to 18, the coefficient of purity ranged from 71 to 87 and the yield in tons from 9 to 22.

The percentage of sugar in the samples from the Arkansas valley ranged from 12 to 20, coefficient of purity from 73 to 86, and the crop in tons from 12 to 40.

The samples from the Grand valley showed percentages of sugar ranging from 12 to 19, coefficients of purity ranging from 74 to 86, and crops from 15 to 42 tons.

The samples from the San Luis valley showed percentages of sugar ranging from 11.5 to 17.9, coefficients of purity from 74.2 to 86.9.

The time of ripening of beets in Colorado will vary, of course, but the average of the samples taken between September 25th and October 10th is 14.1 per cent sugar and 80.7 per cent purity, which is an excellent grade of beet. To get the crop to ripen is the principal aim of the beet grower. The mort important factor in this is that the beet shall be kept growing all the time from the sproutiug of the seed until the harvest. Some of the conditions on which the ripening of the crop depends are beyond the control of the grower. In Colorado it is true in general that the crop will not ripen until the vigor of growth has been checked by frost. The best means of determining whether a crop is ripe or not, that is, in condition to go to the factory, is by means of an analysis, but a good judgment can be formed by cutting a beet and noticing the rate at which the cut surfaces darken.

The increase in percentage of sugar and coefficient of purity during ripening is about three per cent for the former and about five per cent for the latter.

Some very suggestive facts relative to methods of culture were observed during this year's study. Certain principles of beet growing have come to be considered as essential to the production of the best beets. These principles were violated by most of the growers of beets this year, it being their first experience, and yet they obtained good results. It is said that beets should never be planted on new ground. This was violated with good results, giving, in one case, beets of 15.2 per cent sugar and 82.4 per cent purity, and in another 19.4 per cent sugar, and in others the beets were above the average. Ground which had been broken but one year gave uniformly good results. So, too, in regard to time of plowing and subsoiling. All writers on sugar beet culture agree that beets should not be planted on ground that has been recently manured. Sixteen persons report manuring with stable manure. The crops were late in ripening, but with three exceptions, the quality was good. The results as a whole indicate much more gain than loss from the application of stable manure.

The hardest part of beet raising is to get a full stand all over the field. The poor growth of the seed is due to lack of moisture, too deep planting, and poorly prepared ground. The lack of moisture can be overcome in two ways—by irrigating before or after planting the seed. The latter seems to be more promising as a general method. Of fifteen persons trying this method, eight report having obtained a thick stand, being twice as large in proportion as those reporting a thick stand by depending on rain or the original moisture in the ground.

Mr. Geo. H. West of Greeley, contri-

buted an interesting article, published in bulletin No. 42, containing the observations and conclusions of his study of the subject, which he designates "Growing Sugar Beets for Factories." Mr. West studied this subject in Nebraska, Utah, and New Mexico. Of the growing of beets in Nebraska he says: The farmers are largely Germans, with some Russians. Women and children work with the men in the fields. Where a large acreage is in beets, the thinning, weeding, hoeing, pulling, and topping is done by contract. Laborers receive from fifteen to twenty dollars per month, the usual wages by the day being one dollar and board. On contract work the rate is from fifty cents to one dollar for boys; one dollar for men and women, without board. For a man and team, two dollars and fifty cents per day; for man and horse, one dollar and seventy-five cents. Land rent from three dollars and fifty cents to six dollars per acre.

The average yield in 1897 was 7.25 tons, and the sugar extracted by the factory at Norfolk was 10.95 per cent. The percentage of sugar in the beets was 13.1 per cent. purity 81.5 per cent.

The Grand Island beet raisers averaged 8.1 tons per acre. The average percentage of sugar in the beets in 1897 is said to have been 12.87, and purity 79.5. The percentage of sugar obtained from these beets by the factory was 8.72.

The tables given show that in 1897 the factories at Norfolk and Grand Island treated the largest tonnage and made the highest saving attained up to that year. The range of farm wages is from fourteen to twenty dollars per month, with board; and from one dollar to a dollar and a quarter by the day. Women and children generally work on the contract plan. Many girls get a dollar a day in the beet fields, and prefer it to house work. Boys from ten to eighteen years of age receive from fifty to eighty cents per day, a man and team two dollars and fifty cents, and a man and horse one dollar and seventy-five cents per day. Contracts can occasionally be made, as in Colorado, at two dollars per day for man and team. Land rentals range from four dollars to seven dollars per acre. The crop of 1897 is said to have been reduced fully one-third by drought. No beets are grown by irrigation in Nebraska.

At Lehi. Utah, the conditions are said to be ideal for the growing of beets and running a sugar factory. The farms vary from five to forty acres in extent, and fully nine-tenths of them are worked by the owners. Mortgages are rare and the farmers prosperous. The women do not work in the fields, and the girls seldom work there unless at home. Much of the hand labor is done by boys. The average acreage per grower is less than four acres. The highest average yield per acre was in 1896, 13.4 tons. The average per acre from 1891 to 1897, inclusive, was 9.44 tons. The highest average percentage of sugar in the beets was, in 1896, 13.9 per cent. The average percentage from 1891 to 1897, inclusive, was 12.4 per cent. The average percentage of sugar extracted, 1891 to 1897 inclusive, was 8.46. Land rentals range from $7.50 to $15.00. The soil shows a great diversity about Lehi, but is generally a heavier soil than the uplands of northern Colorado.

The Eddy, New Mexico, sugar beet factory has been run for two seasons only, 1896 and 1897. The valley, though a natural fruit garden, lacks the farming population, and perhaps, too, the close, careful cultivation and knowledge of irrigation of the other farm districts of Colorado. In 1897 they grew 1,900 acres of beets; yield, three tons per acre; percentage of sugar, 14.2; purity, 80 per cent; percentage of sugar extracted from the beets, 10.53.

The average cost of growing and delivering a crop of beets at Norfolk, Nebraska, is $26.50 per acre; the average profit $11.04. The yields range from five to fif-

teen tons per acre. The net returns vary from a profit of $29.00 to a loss of $7.55 per acre. At Grand Island, Nebraska, the average was $28.73 per acre, and the average profit $9.27. The yield varied from five to twelve tons per acre, and the net results from a profit of $17.00 to a loss of $12.00 per acre. Mr. West puts the average cost of growing and marketing sugar beets in Nebraska at $30.00 per acre, and states that the officials of both factories put it at the value of seven tons of beets, or $28.00.

The average cost of growing beets in Utah, not including land rentals, is put at $32.50 per acre. The average yield is stated at $10.1 tons, but the yield for 1897 was 6.75 tons. Improved beet cultivating implements had not, at that time, been introduced into Utah, and this, with the higher land rental and cost of irrigation, raises the actual cost to probably $40.00 per acre.

Relative to the profits of beet culture, Mr. West says: Large yields are regularly obtained by those farmers who do thorough, clean work, and intimates that therein lies a big secret of success.

It is also pointed out that the labor question is a most serious problem in this industry. It is too important to be entirely passed over, even in a summary such as this.

Concerning the feeding of pulp to cattle and sheep he gives results obtained in Nebraska and Utah. At Lehi the pulp is placed in silos with addition of about one-half per cent. of its weight of salt. The cattle always have access to plenty of hay, pulp, and water. They never feed a pound of grain in fattening the stock, unless the pulp gives out.

John Reimers, Grand Island, Nebraska, had had three years' experience in feeding pulp to cattle. He fed fifty pounds of pulp, twenty pounds of corn meal, a little bran, and oil cake, and the usual amount of hay per day, as a full ration. Hake Bros., also of Grand Island, fed lambs a mixture of four pounds of pulp to one or one and a half pounds of corn meal, besides hay, as a full ration. The results are highly satisfactory. The pulp is said by Superintendent Geo. Austin, of Lehi, to give the best results after fermenting in the silos for thirty days, and shou not be fed sooner than this.

The experiments made in 1898 are grouped as follows in bulletin No. 51:

1. Different dates of planting. Results in favor of early planting in respect to yield, sugar content, and purity.

2. Planting on freshly plowed ground as compared with planting on ground plowed a few days before planting. Resulted in favor of planting on freshly plowed ground by 2.3 tons in yield, two per cent. in purity, and a slight excess in sugar.

3 Seed irrigated in planting as compared with that not irrigated. Results obtained on the College Farm showed no advantage from this practice. The soil was a rather heavy loam and was moist at planting time. Good results have been observed from this practice on lighter soils.

4. Soaking seed before planting. Results did not show any gain from the soaking of the seed.

5. Sowing at the bottom of a three-inch furrow. The resulting stand was not so good as that obtained by sowing at ordinary depths. The yield was once as good and twice poorer than that from similar rows of ordinary planting. The percentage of sugar and purity were not perceptibly different from other plantings.

6. Different depths of planting. The depths at which the seed was planted were from one-half an inch to an inch and a half. The first series, planted May 11th in a wet soil, showed no difference, but the later planting, made May 27th when the soil had dried out considerably, showed an advantage in favor of the deepest planting, amounting in comparison

with the shallower plantings to more than one-third of the crop. The stand, yield and quality were all better than in the cases of shallower planting.

7. Transplanting. Transplanted beets are usually ill-shaped. The yield may be good, percentage of sugar and purity high, but the method would not be a financial success.

8. Different distances of thinning. The results obtained show that the distance apart of the beets, from four to ten inches, has but slight influence on the quality of the crop as to sugar and purity. In a general way the thicker stand tends to a larger yield, but there are exceptions to this statement.

9. Different dates of thinning. The results show that the thinning of beets can be extended over a period of two weeks without injury to the crop.

10. Variety tests. Six varieties, Zehringen; Vilmorin's improved. grown in Russia; Kleinwanzlebener, grown by Vilmorin; Pitschke's Elite; Vilmorin's French, very rich; and Schreiber's Elite were grown side by side with Kleinwanzlebener, strain not given, with almost identical results in percentage of sugar and purity, the sugar ranging from 15 to 17.20 per cent., and the purity from 76 to 81.9. The average of all the samples analyzed in this test is 16.04 per cent. sugar, and 78.9 purity.

11. Number of irrigations. At Rockyford, beets were grown without irrigation, with one, and with four irrigations. This experiment was of little value, being defeated by the unusually heavy rains of that season.

At Pueblo, Mr. C. K. McHarg applied water to one-half of some experimental plots twice after the 20th of August, the other half receiving none that date. The two later irrigations produced an increase of one-seventh in the weight of the crop, and the percentage of sugar was increased; beets from the half irrigated late, contained 16.42 per cent. sugar, 81.0 purity, and those from the otber half contained 15.79 per cent. sugar, 81.7 purity.

12. American grown seed vs. imported seed. Two samples of American grown seed were used, one grown in Utah and the other in New Mexico, both were strains of Kleinwanzlebener beets. The imported seeds were the Original Kleinwanzlebener, Vilmorin, Mangold and Elite Kleinwanzlebener.

The Elite Kleinwanzlebener and the Vilmorin were sent us by the U. S. Department of Agriculture as the best beet seed that they could get. The Original Kleinwanzlebener was selected by the Utah Sugar Company as, in their judgment, the best brand of seed on the market from which to raise their own seed. The Utah grown seed produced as large a crop and one richer in sugar and purity than the average of these three. It excels its parent strain in richness and purity, and is but little inferior in quality of crop.

The New Mexico seed equals the Vilmorin and is not far behind the original Kleinwanzlebener.

The germinating quality of the seed is quite satisfactory.

In 1899 the questions whose solution were attempted were:

Does it pay to subsoil? The results of ten tests made at this Station show an average gain of 18 per cent. in the weight of the crop as the result of subsoiling.

Is it advisable to plant the best seed very early? The average crop from ten plots sown between April 10th and 20th was 27.7 tons; from ten plots sown between May 1st and 10th was 24.3 tons; from ten plots sown between May 15th and 26th was 20.5 tons; and from ten plots sown between May 31st and June 10th was 15.3.

The percentage of sugar in these various crops scarcely differed at all, 0.76 of one per cent. being the maximum differ-

ence, and 3.2 was the maximum difference in purity. The difference in crop, however, is very decidedly in favor of very early planting.

The question of the distance between rows is recurred to again, and a former recommendation is repeated, i. e., making the alternate spaces between rows narrower and wider. The distances advocated are eleven and twenty-seven inches. The chief advantage claimed is in irrigating, also an increase of crop.

IRRIGATING UP THE SEED.

Twelve experiments were made with irrigating up the seed, and a like number without irrigation. Of the twelve experiments with irrigrtion none failed, of those without irrigation two failed. The crops from the twelve irrigated at the time of planting averaged 26.3 tons to the acre. The crops from the ten plots which came up, but which were not irrigated at the time of planting, averaged 25.4 tons to the acre.

INSECTS INJURIOUS TO BEETS.

The earliest observations on this subject seem to have been made by Prof. C. P. Gillette in 1894, when he records the leaf hoppers Gnathodus abdominalis, Platymetopius acutus, and Agallia uhleri, as doing injury to beets in the vicinity of Grand Junction, also a mealy bug, Dactylapius solani, as infesting the crowns of the plant. The next mention of injury to beets by insects is in 1897, when the writer's patch of beets was seriously injured by the leaf hoppers Agallia uhleri, A. sanguineolenta, A. cinerea, and the striped beetle Systena taeniata. Later Monoxia puncticollis, and also the blister beetle, Macrobases unicolor, did some damage.

In 1869 the beet army-worm (Laphygma flavimaculata) made its appearance near Grand Junction, and was very destructive. It did not appear in injurious numbers in this locality in 1900. Prof. Gillette and his assistant, Mr. E. D. Ball, found but few specimens of either the first or second brood. Prof. Gillette (Thirteenth Annual Report of the Colorado Agricultural Experiment Station) says of this failure of the insect to appear the second season: The very sudden appearance of this insect which had never before been considered injurious, in such destructive numbers, and its equally sudden disappearance, is quite remarkable. Particularly is this so from the fact that the fall brood of worms in 1899 were but little parasitized, and the moths matured in enormous numbers. The latter must have failed, for some reason, to winter over. These worms appeared on some experimental patches of beets at Lamar and Rockyford in 1899, and the first brood appeared in destructive numbers in 1900. The worms began to appear during the first week in June, and were abundant by the 14th, when spraying was begun. Late planted beets were not injured by them, except where they were planted near patches of weeds or earlier beets. The poisons were effectual, especially where two sprayings were made with Paris green.

Other insects mentioned by Prof. Gillette as having been observed on beets and not already mentioned, are Nysius angustatus (often called false cinch bug), more or less abundant everywhere, in some cases causing beets to wilt and die. Deilephila lineata was found as an occasional feeder, especially where purslane was allowed to grow. (Mr. Ball's notes.)

MONEY IN HORSE-RADISH CULTURE.

The cultivation of horse radish is one of the profitable fields neglected by market gardener and general farmer. In the vicinity of large cities men who give the business the proper time and attention clear $300 or more an acre every year. If the roots are sold in the open market these figures are obtained, but when ground and put in cans for use, the profits run up to nearly one thousand dollars an acre. The

demands are never supplied in the large cities, and but few of the smaller towns ever have the roots or salad on the market. No farm should be without at least some plants of the horse radish as it is a most valuable appetizer aud healthful food assistant.

The Bohemian and Bavarian horse radish is found on all hotel and public eating house tables of Europe. It is served in whole roots, thin shavings or the grated salad form, and is regarded as one of the most important items of expenditure for customers. The best roots come from Bayersdorf, where the growers report geting from $250 to 300 an acre from the product. They harvest as many as 10,000 roots from an acre and leave the mother root to come out the following season and make additional crops. The little village has a population of probably 1,500 people all depending on the growing of horse radish and enjoying perfect prosperity.

Horse radish requires a good, rich loam containing little clay to insure a successful crop. In Europe a soil that has been first loosened by a crop of clover or other long fibrous roots, and left in a condition to supply abundant nitrogen is preferred for the root crop. The growers of the United States say, that a tract of land formerly cultivated to cabbage or similar clean crops, is best suited to horse radish planting. The soil should be moist and not wet, deeply plowed and well pulverized. A fertilizer containing about 9 per cent Potash and a similar amount of Phosphoric Acid with 4 per cent nitrogen should be applied in the spring, when the plants are set. An other good mixture per acre would be 300 to 400 pounds of ground bone and 100 pounds of Muriate of Potash. Annual applications of similar fertilizers must be made.

The American plan is to plant small cuttings of roots in rows about 18 inches apart either way, the roots being covered by 6 or 8 inches of earth. In Europe the long roots are set in holes leaning at an angle of about 35 degrees. This is done, so that the shoots may be rubbed during the growing season by the thumb and forefinger, to break off any sprouts or warts that might form and thus make the roots clean and clear. It also gives the harvester a better opportunity for cutting out the roots and leaving the original mother stalk. It is not neccessary in our country to rub the roots, but if they are planted after the foreign plan, they can be harvested more easily. Our markets do not demand the whole root, so that they need not be perfectly smooth to grate.

Cultivation of horse radish is an essential feature and the profit depends much on the way this is done. The ground should be kept loose on the surface and the weeds and grasses kept well cleaned out from the beds. If several shoots come up from the root the smaller ones should be carefully broken off to prevent the strength of the plant coming to the top rather than the root. Good roots will form each year and the new ones should be cut out in the fall or early in the spring, before the plants are too far advanced in growing. A Mattock is generally used in digging the roots for home use or the market. The leaves are first cut off and a stroke made on either side of the plant to bare the roots when those wanted are cut off, leaving the mother root about one foot beneath the surface.

Marketing is best done by grinding or grating the roots and thus preparing them for the table. In the cities however the whole roots are in demand, at from eight to fifteen cents a pound. The grower will soon learn which is the best way to get into market and supply the demand accordingly.

THE CULTIVATION OF TEA.

Tea culture is one of the established industries of the Southern portion of the United States. Experiments conducted

for the past ten years have fully demonstrated that the commercial tea can be produced and that at least 400 pounds may be taken from an acre. The most extensive tea gardens are operated in South Carolina where 50 acres are planted and produce an average of 400 pounds per acre. In the oriental isles some of the most successful tea growers get 1,000 pounds from an acre. The tea plants will stand cold as low as zero and are, therefore, adapted to nearly all of the great South.

The different grades of tea used consist of the leaves of the Camellia tea. The original plant comes from Assam in Northern British India. It grows luxuriously often attaining a height of 25 feet. The leaves are a bright green, measuring 9 inches in length and four inches in width. The trees were transplanted in Japan and became more stunted, the growth being small or large in proportion to the heat or cold in which it grew. It requires a rich, well drained soil, containing plenty of plant food, where the rainfall is abundant and the climate not too severe.

There are about fifty varieties of tea that have been acclimated to other countries beside the hot valleys of India, Among them are the Darjeeling, Kangra. Kumaon, Ceylon, Formosa, Chinese and Japanese. Seed comes from China and Japan and costs from 50 cents to $1.00 per pound. There are approximately 400 seeds in a pound. The seed should be planted early in the Fall, on light, sandy soil, to the depth of two or three inches. If the rainfall is not enough to keep up good, perfect moisture, artificial irrigation should be applied. The seeds germinate in early spring and plants will reach a height of 6 to 8 inches during the first summer.

The soil for the tea crop should be thoroughly pulverized and put in good condition before transplanting the trees. It is essential, of course, that a sufficient amount of plant food be supplied, as the tea needs nourishment, the same as any other plant. Both the quality and quantity will be influenced by the kind of fertilizer applied. A suitable mixture for tea would be about 400 to 500 pounds of a complete fertilizer, which should analyze 3 per cent Nitrogen, 7 per cent Phosphoric Acid and 8 per cent Potash; in place of this from 300 to 400 pounds of Bone Meal and 150 pounds of Muriate of Potash can be applied per acre. The fertilizer should be broadcasted and then thoroughly mixed with the soil.

Leaves may be plucked from the trees the second year. Crops will increase every season for a number of years, the trees probably being at their best in six or seven years. The yield of tea bush generally ranges about 5 ounces of dried tea, ready for market. Leaves are generally picked by children who receive 50 cents per day for their work. It requires 4 pounds of green leaves to make one pound of the dried product. Picking may be made every ten days or about twenty times during the season.

The tea is prepared for market by being rolled or fired to make the green or black teas of commerce. For these purposes machines are employed. These are manufactured especially for the purpose and may be made by the grower with but little expense. The work of tea growing is new but is worthy an investigation by every farmer in the Southern States. The immense volumns of tea imported every year makes a great amount of money sent to foreign lands which should be kept in the South. As the Southern portion of our country is rapidly developing into one of the richest sections of the world, and tea is one of the natural products of the soil and climate, it should become one of the money-making crops.

JOEL SHOMAKRR.

FERTILIZING THE ORCHARD.

The orchards of this country are the most neglected of any of our crops. It may seem strange to some to call an orchard a crop, but that is what it is. It is grown for the purpose of producing something for use or sale just as other crops are, and it is a notorious fact that this crop is more neglected than any other we grow. Prof. L. H. Bailey, of Cornell, recently said some things about orchard management. He said:

Good drainage, natu.al or artificial, is essential to success. Trees are impatient of wet feet.

Good tillage increases the available food supply of the soil, and also conserves its moisture.

Tillage should be begun just as soon as the ground is dry enough in the spring, and should be repeated as often as once in ten days throughout the growing season, which extends from spring until July or August.

Only cultivated crops should be allowed in orchards early in the season. Grain and hay should never be grown.

Even-howed or cultivated crops rob the trees of moisture and fertility if they are allowed to stand above the tree roots.

Watch a sod orchard. It will begin to fail before you know it.

Probably nine-tenths of the apple orchards are in sod, and many of them are meadows. Of course they are failing.

The remedy for these apple failures is to cut down many of the orchards. For the remainder of the treatment is cultivation, spraying—the trinity of orthodox apple growing.

Potash is the chief fertilizer to be applied to fruit trees, particularly after they come into bearing.

Potash may be had in wood ashes and muriate of potash. It is most commonly used in the latter form. An unusual application of potash should be made upon bearing orchards, 500 pounds to the acre.

Phosphoric acid is the second important fertilizer to be applied artificially to orchards. Of the plain superphosphates, from 300 to 500 pounds may be applied to the acre.

Nitrogen can be obtained cheapest by means of thorough tillage (to promote nitrification) and nitrogenous green manures.

Barn manures are generally more economically used when applied to farm crops than when applied to orchards; yet they can be used with good results, particularly when rejuvenating the old orchards.

SOIL MAPS.

The Department of Agriculture at Washington will soon issue soil maps which will enable the farmer wherever he is located to determine just what crops will bring him the largest returns. They are printed in colors, the meaning of the different colors fully explained and suggestions as to relative values of soils and their adaptability to crops offered for the guidance of the tiller of the land.

The magnitude of the work may be understood when it is known that the entire conntry will be included. The vast single map which will represent the country as a whole will indicate each ten-acre plot by a square one-eighth inch in size. But each farmer will be able to procure a chart of his own neighborhood on a larger scale, so that he can arrange his planting in accordance with the suggestions which it conveys. The work is done by townships to start with, and these are put together to make counties, which are finally assembled to form complete maps of states

Hitherto the business of farming has been to some extent guess work; the farmer formed a surmise as to what crop were best for him to try, and did his planting accordingly. Henceforth it may be quite different. He may study the government map, and from it may obtain advice based on the highest scientific knowledge as to what will be best for him to grow. Then

he can go ahead with a reasonable certainty of satisfactory results. In the first place, the soil map will show what kind of agricultural industry any given locality is best adapted for, whether fruit raising, vegetable growing, dairying, or general farming. The value of this to home-seeking folk, who desire to engage in certain lines of production, cannot be overestimated. Then, after the general location is determined he will find the specific place on which he best may succeed by consulting the detailed description on the map of just the piece of land required.

The map will call attention to certain troubles of soils which have been investigated through chemical analyses. One of these is acidity, which has an important influenee upon farming over large areas; another is excess or deficiency or certain elements of plant growth, which can be supplied by fertilizers; and yet another is alkali. As for alkali, seience has ascertained both the source of it and the remedy. It comes usually from wash from the mountains, from salts carried on to the land by irrigation, or from deposits laid down at a period when the land was sea bottom. The remedy is to under-drain the land and wash out the alkali and to prevent the accumulation of seepage water in the subsoil.

The map will give a basis for the introduction of new crops from abroad by showing what areas are specially adapted to certain kinds of plants. It was incidental st this investigation that the important fact was ascertained that real Sumatra tobacco could be grown in the Connecticut valley, a discovory which will put millions of dollars into the pockets of American producers. In these days of rapid agricultural development it is of the utmost importance to encourage in every possible way the introduction and spread of new industries, such as truck growing, fruit culture on improved principles, etc., and the soil map here described has an obvious and important bearing upon all such problems.

It is along these advanced lines of agricultural development that the department must do its most important work. It is gratifying to note the order and consistency with which the work is being pressed toward certain definite results—toward the continued extension of the scope of our agricultural products on the one hand and the acquirement of power to produce from a given piece of lano the utmost of which it is capable of yielding, on the other. With such a wealth of intelligent thought and effort directed in its interest. American agriculture must steadily rise to higher ground.

ODDS AND ENDS.

GEM FROM PHILIPPINES.

A Denver lady is in receipt of one of the best souvenirs that has yet come from the Philippines, says the *Chattanooga* (Tenn.) *News*. It is a New Year's card sent by a relative, who is commanding one of the volunteer regiments.

The card, or rather album, is a home-made affair, evidently altogether his own handiwork. On every other page is a verse of poetry, not the ordinary doggerel of the average youth, but real poetry. On the alternate pages are camera views of scenes in the land of the Orient. The leaves are neatly bound together with a piece of blue ribbon, and on the cover are pen sketches, very artistically done, while the whole is most attractive.

The verses are as follows:

Oh! the big round moon's a-fillin' all the
camp with silver light,
And among the ferns and bushes dodge
the fireflies big and bright,
And the boys rolled in their blankets sleep
as silent as the dead,
And the night wind rustles softly in the
palm leaves overhead.

I can hear the guard a-walkin' and off
somewhere, pretty far,
There's a native woman singin' and a-
thumpin' a guitar;
And the music sets me dreamin' and my
thoughts are bound to roam
To the girl that sings supraner in our
meet'n' house at home.

Round me bends the feathered grasses
with the dew a-shinin' wet,
And the palm tree 'gainst the skyline
makes a ragged silhouette,
And that old guitar a-plunkin' isn't just a
concert band,
And she sings in Filipino, so I do not un-
derstand.

But there's magic in it surely, for it takes
me far away,
Till the smell of tropic flowers turns to
that of new-mown hay,
And I'm lis'nin', carried somehow over
miles and miles of foam,
To the girl that sings supraner in our
meet'n' house at home.

I'm a-sittin' dressed for Sunday in the old,
familiar pew.
And I hear the parson ironin', like he
never would get through;
I can see the sunshine streamin' through
the window's colored stain,
And I smell cologne and camphor; yes,
and pep'mint, plain as plain.

I can hear Aunt Hannah coughin'; I can
hear old Jenkins snore,
And the hymn book pages rustle as the
people thumb 'em o'er;
And I hear the sweet notes risin' upward
towards the heavenly dome,
As that girl, she sings supraner in our
meet'n' house at home.

But the old guitar stops playin' and the
singin' it stops too,
And my Sunday clothes are turnin' khaki
brown and army blue;
And the church in old New England is
once more a forest black,
Full of Malay heathens, hopin' they may
shoot me in the back.

But I thank the native woman for the com-
fort of her song,
And I hope the mail boat's hustlin' that's
a-comin' from Hongkong,

For I know it brings a letter, o'er the South Pacific's foam,
From the girl that sings supraner in our meet'n' house at home.

MILE A MINUTE SNUB.

We worked for Bill McKinley, and we hustled for him fair;
We argued and we quarreled till he landed in the chair;
We pointed out the future; 'twould be glorious and grand
If folks would only recognize that he could save the land;
But when he got to Bowersville upon this western trip
His train slid by our station
At a
mile a minute
clip.

Why, when we read the papers—how he planned to come this way—
We bought a bunch of banners and got ready for the day;
We put flags on the deepo and put up a speaker's stand
And bought a lot of musie for the Bowersville brass band,
And when the engines whistled we prepared to let 'er rip,
But the train went by us people
At a
mile a minute
clip.

We're done with Bill McKinley. He's a emperor—that's what—
To pass the men that made him like they wasn't on the spot!
Yes, sir. He's lost his chances when they was within his reach.
We've got some unused fireworks—and—I—had—prepared a speech—
A few short words of welcome, but McKinley got too flip
When he rattled by our station
At a
mile a minute
clip.

ABOUT EXCHANGES.

SCRIBNER'S.

For July contains a "Tour in Sicily," by Rufus B. Richardson; "Parkman at Lake George," Francis Parkman; "Uncle David," by LeRey Milton Yale; "Krag, the Kootenay Ram," Part II, by Ernest Seton-Thompson, author of "Wild Animals I have Known"; "When Gitchigamme warned the Muscovite," by Sewell Ford; "Some Famous Orators I have Heard," by George F. Hoar; "Passages from a Diary in the Pacific—Tahiti," John La Farge; "The Delta Country of Alaska," G. R. Putnam; "Homesick," Julia C. R. Dore; "The Diary of a Goose Girl—Chaps. IX.-XI," by Kate Douglas Wiggin; "Matthew Arnold," by W. C. Brownell; "Dawn at Venice," by Martha Gilbert Dickinson; "The Field of Art,"—Daumier to Forain.

LADIES' HOME JOURNAL.

Seldom has a better chance for "stay-at-home traveling" been offered than in the *Ladies' Home Journal* for July. From West Point, as pictured by George Gibbs on the cover, readers may go with W. L. Taylor to see "A Busy Boston Street at High Noon;" next try "Goin' Fishin' with Joe Jefferson" in Florida; then travel out West with Ernest Seton-Thompson to see "The Mother Teal and the Overland Route"; next go along the Atlantic coast to find out how the places "Where our Country Began" look to-day; then seek Northern Michigan to hear "The Story of a Maple Tree," by William Davenport Hulbert; next visit an Eastern magazine editor's office and enjoy the good-humored raillery of "The Case Against the Editor," by Edward Bok; and finally see what "The Country of Sheridan's Ride" looks like nowadays. There are many other articles of equal interest on various subjects.

SATURDAY EVENING POST.

Twenty-five years ago, when "Elbow Room" and "Out of the Hurly-Burly" were the successes of the day, Max Adeler

suddenly ceased writing. For a quarter of a century he was proof against the blandishments of editors, but within a few weeks he has completed a new series of humorous stories which show him at his best. Tales of Old Turley, which will appear in early numbers of *The Saturday Evening Post*, are wonderfully droll stories of the quaint characters in an old-fashioned country town before the war. Local politics, school committee fights, church squabbles and women's clubs lend themselves admirably to Max Adeler's humorous touch, and form the basis of some of the cleverest stories that have been written for many a day.

MCCLURE'S MAGAZINE

for July contains "Long Distance Baloon Racing," by Walter Wellman, the new sport as practiced by the French. Illustrated by W. R. Leigh; "With Mrs. Kenworthy's Assistance," by Pascal H. Coggins; illustrated by Henry Hutt; "The Story of the Declaration of Independence," by Ida M. Tarbell, illustrated with authentic portraits and fac-simile autographs of the signers; "Within the Gates," by Elizabeth Stuart Phelps, Act III, end of drama Illustrated by Harry Fenn; "Two of a Kind," by Ellsworth Kelley; illustrated by Orson Lowell; "Recollections of E. L. Davenport," by Clara Morris; illustrated with a portrait; "The Loon," by William Davenport Hulbert; illustrated by W. M. Hardy; "Kim," by Rudyard Kipling, chapters XI (continued) and XII; illustrated by Edwin Lord Weeks; "Praesto," a poem, by T. E. Brown; "Governor Odell of New York," by Rollo Ogden, a business man in politics; "The Striker's Story," by Frank H. Spearman, McTerza and the Railroad Riot; illustrated by Jay Hambidge; "Hare and Tortoise," by George Madden Martin, How Emmy Lou Spelled Down the Second Reader; illustrated by Charles L. Hinton.

THE FORUM.

The July *Forum* is opened by important articles on political problems of the day. The first, by Mr. W. C. Jameson Reid, is "A Plea for the Integrity of China," as against the attempts of European powers to secure its partition for their own advantage. Congressman H. S. Boutell shows the bearing of "The Sale of Texas to Spain" upon the question whether all territory acquired by the government becomes *ipso facto* "an integral part" of the United States. Other political articles are contributed by Oscar W. Underwood, who protests against "The Corrupting Power of Public Patronage," and by Mr. Walter Macarthur, who gives an account of "The Movement for a Shorter Working Day." Five articles deal, more or less, with educational subjects. President Thwing, of Western Reserve University, brings together the opinions he has gathered from graduate correspondents respecting "The Shortened College Course." Mr. Jacob Schoenhof quotes the example of European and English enterprise to stimulate this country to pay greater attention to "Higher Technical Training." Mr. John Corbin puts the question, "Is the Elective System Elective?" and shows that in many cases the object intended by this system is not fulfilled. Mr. R. Clark points out "Certain Failures in School Hygiene," which he has noticed in various schools in several States. Prof. A. D. F. Hamlin, of Columbia University, offers "A Plea for Architectural Studies" on account of the valuable contribution they make to general culture Other articles are: "Medical Practice and the Law," by Mr. Champe S. Andrews; "The Ethics of Loot," by Dr. Gilbert Reid; "The Liberal Party, a Menace to English Democracy," by Mrs. Mahood; and "Religious Journalism in England and America," by Mr. Herbert W. Horwill.

THE IRRIGATION A

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The Man From India. The author of the leading article in this number, Mr. E. H. Pargiter, has been in the employ of the English government for the last 26 years in northern India in the construction and management of irrigation canals. At present he is traveling through the United States, and if he is suited with the outlook and prospects, may locate here permanently. The article is too long for one issue, consequently it will be continued in following numbers until completed.

Artesian Water Discovery. In the West oil and water, it seems, go hand in hand, notwithstanding their natural antipathy to one another. The search for petroleum on the Mohave desert in California has resulted in the development of a supply of artesian water which is destined in time to prove of more value than oil. The discovery, says the San Francisco *Chronicle*, has been made near Victor, a mining town located in the heart of the desert on the Colton-Barstow branch of the Santa Fe system, midway between those two places. Prospecting for oil has been in progress there for weeks, as it is on the line of the supposed extension of the Kern river belt. Three wells have struck a strong artesian flow of water within the past week. All of them are represented to be gushers. The last of the three penetrated the water belt at a depth of 185 feet, and it is yielding a steady stream of 215 miner's inches. It emerges from the earth with such force that up to the present time the owners have failed to cap the pipe, and the flow is consequently unrestrained.

This fortunate discovery has given a new and unexpected value to the land and revolutionized the prospects of that desolate region. If the water belt is found to underlie the whole desert it will doubtless become one of the most productive agricultural districts in the State. All that the soil in that section needs to make it produce crops of any kind is moisture. Wherever the soil could be irrigated it has yielded generously. But the available water supply has been so scant that it has been impossible to cultivate more than a few small areas scattered widely apart along the edge of the great barren waste.

Homes for Toilers. Mr. A. H. Naftzger, the President of the Southern California Fruit Exchange, recently testified before the Industrial Commission at Washington. Mr. Naftzger, whose business is dependent almost solely upon irrigation, made some interesting statements regarding the subject. Among other things, he said:

"It has been carefully estimated that under a system of national irrigation seventy-five million to one hundred million of acres of lands now practically desert and worthless could be reclaimed and made productive. It would be nearly or quite impossible to do this without Gov-

ernment aid. If Government aid be objected to on the ground that the development of these arid lands would bring them into productive competition with, and tend to decrease values of farming lands in the Eastern States, the answer is, first, that the development of any portion of our country is incidentally a benefit to all; but more specifically, if these desert lands should be watered, vast quantities of machinery, implements, and other manufactured goods will be required by the settlers upon the lands, practically all of which manufactured goods would have to come from Eastern States. This alone, I think, would more than compensate for any otherwise possible depreciation of Eastern farming lands, occasioned by increased Western competition. If the West shall have more water, the East will have more trade.

"But these Western lands would for the most part be devoted to a different class of products than those of the Eastern States, increasing interstate commerce and developing home markets in both directions.

"Again, who can say that these Western lands will not be needed for homes for the overflow of Eastern cities and towns. Under the rapidly developing economic and industrial conditions now astonishing the world, and particularly by reason of the introduction of the 'community of interest' idea, having for its ostensible object economy in both production and distribution, there is strong probability that many who are now wage earners must in the near future obtain their livelihood by cultivation of the soil. The Government owns these arid lands, and it is certainly not unreasonable nor improvident that it should expend some of its revenues in making them irrigable."

The Nile and the Missouri. Egyptian agriculture has only reached its high state of perfection through the aid of irrigation. All of the land under cultivation—over 6,000,000 acres—is irrigated. That which is not irrigated is a desert. Egypt, with its world-famous Nile, has many pages in the history of the world, so that irrigation may be said to be one of the prime history-makers of the world. It has been stated that the irrigated land of Egypt supports a population of over 5,000,000 people, and at the same time pays a national debt one-half as large as that of the United States.

With all its fame the Nile does not water nearly as much territory as could one of our own rivers. The Missouri, in time to come, may, too, have its place in the history of the world. Agriculture brings industry and industry begets peace. The Missouri and its tributaries are susceptible of supplying water for many times the area supported by the Nile.

An Irrigated Island. On the small island of Madeira, west coast of Africa, irrigation is practiced more extensively, in proportion to the area of the island, which is only 120 square miles, than in any country in the world; fully one-half of the island being under water systems. Madeira is in reality an irrigated patch in the ocean, growing splendid crops. Canals have been constructed with care and skill, some of them sixty or more miles in length. The thrifty farmers have on their land reservoirs, into which they collect their share of the water when it is delivered to them, and from them distribute it to their crops as desired.

The Reclamation Problem. The irrigation problem is one of the most important questions before the people of this country. It is of vital interest to the West, for statistics show that the population of many of the country districts of the West is not as great at the present time as it was ten years ago. The people have been attracted to the cities and the cities have increased in population. While Congress at its last

session did nothing for irrigation, the subject was more generally discussed than heretofore, and a foundation was laid for practical advance in the immediate future. The idea of the reclamation of arid lands is better understood than ever before, and the question is now in shape for a good reclamation bill. If the people of the West will see that Representatives are elected on a stout irrigation platform, there is little doubt that a bill looking in the right direction can be passed.

The opposition found in some sections of the East to the reclamation of the arid lands is not well taken. A little consideration will show the most obtuse mind that the development of the West is to the direct advantage of the eastern half of the country. It is to the advantage of the farmers of the East, as the Western peeple buy the products of the Eastern factories, and the workers of the factories are provided with food from the farms of the East. More money will be put into the pockets of the East by the reclamation of the arid wastes than is taken out, many times over. A wider market is what the East needs and it is presented in the proposed irrigation of vast tracts west of the Mississippi river.

The general plan of reclamation is to start upon a few well-defined irrigation projects which are too large for private enterprise. Storage reservoirs present a good beginning and the Government should undertake no reservoir which does not have a capacity for irrigating at least 100,000 acres of land.

Spain now has 18,000,000 people. Spain is a semi-arid country which borders on the ocean. Nevada and Utah, with the proper application of water which is actually available in those two States, can maintain as great a population as that of the interior of Spain. Colorada has 3,000,000 acres of land under ditch, but it is possible to double the area if reasonable methods are applied.

The problem of the reclamation of our arid lands is a large one, and those who have not been through the West and studied it can hardly realize its great national bearing.—*National Irrigation.*

Irrigation in Turkey. Consul Norton, at Harput, Armenia, has made a report to the State Department showing the great possibilities for irrigation in Turkey, and calling attention to the fact that the Ottoman government is anxious to undertake some experimental artesian well borings. Much of this region, Mr. Norton states, was under irrigation and had great agricultural wealth 2,000 years ago, but the entire deforestation of the mountains has stopped the water supply and rendered the land unproductive. The Turkish government is now wisely undertaking to reclaim some of this territory.

The Desert Watered. An exhibit made in the June issue of *National Irrigation* of the development of Riverside and Redlands, California, which was prepared by Mr. Charles E. Richards, of Los Angeles, and which shows what a few years of irrigation will do for a sage-brush desert, presents an impressive object lesson to the easterner who has business connections with the West. Merchants who at present find a market in the western States for a thousand dollars' worth of their goods annually would sell ten thousand dollars' worth if those arid lands were irrigated with the waters now running uselessly away.

The building of storage reservoirs by the Government would make populous many such desert spots as were Riverside and Redlands only a few years ago.

Irrigated Rice. Americans are growing great quantities of rice. The Secretary of Agriculture says that we can not only grow all our own rice, but that we can profitably export it. There is in Louisiana and Texas what might be called a rice boom. In Louisiana over 100,000

acres are under irrigation for this crop, while Texas is developing very extensive acreages. The possibility of using improved machinery is largely responsible for this. The oriental method of harvesting the crop is for a laborer to wade into the rice slough with a sickle and reap a fraction of an acre a day. The Louisiana and Texas method is to plant the rice in plats surrounded by small levees or furrows, into which plats water is then turned. When the rice is nearly ripe, the levee is broken down and the water allowed to run off. In a few days, when the rice has ripened, the soil has dried sufficiently to allow a machine harvester to go upon the land and do the work of many men.

"JUST FOR THE FUN OF IT."

By J. M. W. Randegg.

Some men take life serious, some as a jest,
However they take it, each thinks his the best,
And each tries to make the best of it.
I am one of those mortals who thinks it all fun,
And laugh with the rising and setting sun,
Take things as they come, for the fun of it.
I laugh with every bright, sunny day—
When clouds shed tears, I laugh them away
Its best to make the best of it.
Who cares for my sorrow? The world loves a smile
To drown its own misery — it's cares to beguile,
So I laugh with the world, for the fun of it.
There are times when I feel "blue devils" creep
Upon me till my soul would weep.
But I laugh and make the best of it.
A smile that I meet but adds to the spice
Of life, and makes earth paradise,
And I smile right back, for the fun of it.
And as I am wandering, mile upon mile
O'er roughly hewn paths of this planet, I smile,
Not minding, but making the best of it.
When I cast in my chips, below or above,
Where we're all put to work, coal or clouds to shove.
I shall think it's all for the fun of it.
So I throw to the winds all trouble and care
And go through the world to do or to dare
Whatever betake, make the best of it.
A man lives but once, and the time is So short
When death leads him out to some lonely, strange port.
So I laugh while I live, for the fun of it.

IRRIGATION IN INDIA AND AMERICA.

By E. H. Pargiter, of the Irrigation Branch, Public Works Department, Panjab, India.

The writer of this article, after passing through the three years' course of theoretical study and practical training at the Royal Indian Engineering College at Cooper's Hill, England, (being one of the students who entered this college when it was first started in 1871), went out to India in 1874 as an assistant engineer in the Irrigation Branch of the Public Works Department in the Panjab Province. He has spent his whole service since then in that Province on the design, construction and management of many of the Irrigation Canals, large and small, in different parts of that Province.

It will, perhaps, be as well to explain here briefly the system of the Indian Public Works department. All buildings and works required solely for troops and military purposes, belong to a separate Military Works Department, which is worked and engineered chiefly by officers of the Corps of Royal Engineers. All buildings and works required for civil or general purposes, are in the charge of the Public Works Department, which is now worked and engineered chiefly by civil engineers, together with some Royal Engineers, and other military men trained as engineers, who have chosen to take up service in this department, while they can be spared from military duty.

The Department is divided into three separate branches, quite independent of each other, viz.: the Railway branch, the Irrigation branch, and the Roads and Buildings branch. There is but one railway branch for the whole of India, under one Director, quite irrespective of the different Provinces, so that a railway engineer may be transferred from one part of India to any other part at any time; and railways are constructed and worked in sections that are in no way fixed by the boundaries of Provinces. But there is a distinct Irrigation branch, and a distinct Roads and Buildings branch in each Province, each under its own chief engineer, who is secretary to the Local Provincial Government for his branch.

Transfers from one branch to another are not frequent or usual, so that the majority of the engineers who enter the Department remain each in the branch in which he commenced his service, and they should become in time more or less experts and specialists—in their particular lines of professional work. This separation of the branches has been found necessary for efficiency, for both in railway

and in irrigation work an engineer requires a great deal of special knowledge and experience. He must have several years' training on the construction and management of railways and canals before he is fully competent to design, construct, or manage a railway or irrigation canal to the best advantage. Hence arises the advisability of an engineer beginning at the bottom of the ladder in either department and steadily working his way up. He by degrees becomes better fitted for and also obtains, in course of time, the charge of more and more important works, according to the experience gained and the abilities displayed by him.

There is another point of considerable importance that concerns the Irrigation branch especially, more than the other branches, and makes transfers of engineers from one Province to another most inconvenient. This is the fact that the engineer in charge of a completed and running canal has not only to look after the canal and its distributaries and maintain them in proper working order, but has also to arrange for the due allotment of water to every estate or holding, for the measurement and record of every acre irrigated and for the proper assessment with water rates of all fields watered and crops grown thereby. These duties bring him into constant and close communication with the irrigators, who are mostly simple village folk; and it is highly desirable, for the most efficient and economical management of a canal, that he be in close touch, and be able to converse freely in their own language with the country village people.

Now the language of the village people in one province is very different from that in another province. The universal official language, Urdu or Hindustani, is known only by educated people and those that have lived in connection with such. But the simple country people, living in small villages scattered over the country, and getting little or no education beyond what their isolated life and self-sufficing communities require, speak only their own dialect and can understand but little of the ornate Hindustani, the vocabulary of which is largely made up of Arabic and Persian words, quite foreign to the native dialects of India. An European official, after some years residence in one Province, should have to some extent acquired the language of that Province, and be able fairly well to understand and make himself understood by the people. But if he should be transferred to another Province, he at once finds himself among a new people, speaking quite a different language, which he cannot understand nor express himself in. Therefore, though as an engineer his efficiency is as great as before, as an administrator it is very much hampered. Hence on account of the languages of the country, transfers from one Province to another are inadvisable and not usual; while for the sake of professional experience and efficiency, transfers

from one branch of the Department to another are not advisable and are sparingly effected.

The different Provinces of India, each ruled by its Governor or Lieutenant Governor, with Secretaries for the various departments of the administration, are in some respects comparable to the different States of the Union of the United States of America; and the Government of India, to the Federal Government of the United States; after making full allowance for the very important and distinguishing point of difference, that the Government of India is mainly bureaucratic, while that of the United States is representative. Again such powers of local self-government as a Province has, have been delegated by the Government of India, which is in all matters supreme, and always retains in its own power the appointment of Provincial Governors and their chief officials and Secretaries.

This supremacy of the Government of India over the administration of the Provinces effectually safeguards the country against an existing and useful irrigation canal being deprived of its water supply from a river, by the construction of another canal higher up the river in perhaps another Province. For no such canal can be constructed by any private person or company without the express permission of the Government; for it is laid down in the law that the Government is the sole owner of all the water in all natural streams and lakes, and every project for a canal would have to receive the sanction of the Government of India, before any expenditure could be incurred by a Provincial Government on its construction. Before that sanction could be given, the report on the project would have to clearly show that, either no existing rights or interests would be injured by the construction and working of the proposed canal, or that if any such injury would result, full compensation or reparation was provided for. As a matter of fact, no private canals of any size or importance exist in North India. There are a few small ones whose supply does not appreciably affect the volume of water in the rivers that feed them. And in the case of all Government canals full investigation is made, and care taken to provide against any detriment to existing irrigation rights. In this respect the solicitude of the Government for the protection and well being of the people is strikingly paternal, and even grand-motherly at times. The improvement of the country and the colonization of the waste lands is slow but sure. All this is in striking contrast with what has taken place in the Western States of the United States, where irrigation is a necessity for the cultivation of the country. Private enterprise, not only unrestrained, but encouraged and allowed full scope for the development of its schems, has rapidly engraved the face of the land with numerous canals and ditches and turned grass prairies and barren unproductive tracts into green fields

and smiling orchards. Within the borders of any one State ample provision can be and generally has been made to protect and safeguard the rights of first users against usurpation of the water supply by later comers. But where the sources of a river, whose water is utilized in a State for irrigation, are not within that State, but in another State, it may always happen, and has happened repeatedly already, that the residents of the latter State can divert the water to their own use and purposes, and absolutely deprive the users of it in the other State, of all right to it. An over-ruling supreme power in such cases certainly appears to be called for, and could without difficulty be vested in the Federal Government, or in a kind of Board of Arbitration formed by the States concerned. Such an arrangement should give confidence to owners and users of existing irrigation facilities and also to prospectors and constructors of new canals and ditches that their property would not be liable to become worthless, and their labor and money thrown away. If the boundaries of States requiring irrigation canals could have been fixed carefully along the great watersheds of the country much inconvenience and loss would have been saved and litigation prevented. Lines of latitude and longitude can never form such satisfactory geographical boundaries as the natural physical features of a country do. Creation was not made to correspond or fit in with them in any way. To force States or countries to regulate their boundaries in exact accordance with them tends to cripple the States and countries and deprive them of necessary members and extremities, which, falling within the border of another State of generally a different agricultural type. are of little use to the rest of that State and have their capabilities and resources neglected, or even made to suffer by adverse legislation. Such boundaries form a kind of bed of Procrustes, compelling different physical types of natural creation to conform to the same human legislative pattern. It may be now too late to make any alterations of State boundaries; but their inconveniences in the matter of allowing the same water supply to belong to different States might be minimized by the provision of some controlling or arbitrating authority. The people of America have already effected such wonders and overcome so many difficulties, that they should find it quite feasible to arrange something satisfactory in the settlement of disputes and troubles as to water supply for irrigation purposes.

In States where the water of streams is not required for irrigation, riparian rights to the use or ownership of the water may reasonably be upheld. But where the water is absolutely necessary for irrigation purposes in order that the land may be cultivated and inhabited, it really becomes the life blood of the country, which without its vivifying influence permeating everywhere is as a dead body,

lifeless and useless. To make a mass of flesh a living, working body, the blood must not simply flow through a few main arteries, but must be conducted throughout the whole body, and penetrate to every cell, from main artery to branch arteries, and then to capillaries. Similarly, in an arid country, the water in a stream or river should not be held to belong to the land forming its banks alone but to every portion of land to which it can be conveyed. The river artery can distribute its life-blood to canals or ditches as branch arteries; and these in their turn to laterals and watercourses, as capillaries, to be conveyed to every field and to make the land a living, producing country. Under these conditions, riparian rights are an anomaly, and require to be superseded by the right of the whole neighboring land to the beneficial action of the water. The lands bordering a river will always retain the natural advantages they possess of proximity to the source of the supply of water and the consequent power to bring the water on the land with a small expenditure of labor and money; but that they should be given or allowed to claim the exclusive right to the use of the water in arid regions is really indefensible. To insist that the law of water rights applicable to and permissable in States with ample rainfall must necessarily be applied to arid States is to enact again the old story of Procrustes and his bed.

It should be clearly understood that meteorological conditions vary very much throughout the great plains of North India. The regular rainy season lasts from the middle of June to the middle of September, and during this time the monsoon from the Bay of Bengal gives the Province of Bengal a heavy rainfall sufficient to grow rice with extensively without the aid of irrigation. As the monsoon sweeps up country to the northwest, along and parallel to the Himalaya range of mountains, it gradually parts with its moisture and the rainfall decreases as it proceeds. Throughout the Northwest Provinces the rainfall is sufficient for maturing ordinary crops; but as the Panjab is reached, the belt of country lying to the South of the Himalayas receives just enough rain for growing crops on, but the tracts further to the South and Southwest obtain very little and are desert; for the rainfall diminishes with the distance from these mountains. Wherever the average annual rainfall is less than 15 inches cultivation becomes impossible without irrigation from wells or canals. About four-fifths of the total annual fall comes in the three months of the hot weather rainy season; of the remaining portion nearly all usually comes in one or two spells of several days each, in December, January, or February. Occasional showers are received at other times. In the belt of country which receives a little less than 15 inches of annual rainfall, a plentiful crop of fine grass grows, sufficient to support large herds of cattle and flocks of goats and sheep,

while in local hollows which receive the drainage from surrounding higher lands, and so become well saturated with water, crops can be grown, aided by irrigation from wells, where the depth of the spring level below the ground is not too great, the water being raised in a chain of earthen pots on a wheel, worked by bullock power; lifts up to 50 or 60 feet are sometimes worked.

In the Province of Bengal there are some canals, large and small, constructed by the Government. In most years these do comparatively little irrigation, as the rainfall is amply sufficient for the crops grown by the people; and then these canals often do not even pay their working expenses, much less any interest on their capital cost. But in one or two years out of ten or eleven years the rainfall is deficient, and then the cultivators are glad to avail themselves of the supply these canals afford. They therefore serve as protective works against the ill consequences of years of scarcity or famine; and though they do not pay as a commercial speculation when only their revenues from assessed water rates are considered, yet they enable the people to tide over bad years, and keep up the cultivated area, land revenue, and trade, to their usual amounts. Thus the Government finds it worth its while to maintain these canals every year in good order for their indirect results, and to keep up the full establishment necessary for working them, as it is impossible to foretell in what year they may not be balled on to supplement a poor rainfall.

In the Northwest Provinces irrigation canals begin to pay commercially by bringing in a good net revenue after paying all working expenses and interest on the capital cost of construction. The river Ganges is tapped by two large canals; one, the upper Ganges canal takes out at Hardwar, at the foot of the lower hills, where the great plain is entered by the river; and the other, the lower Ganges canal, takes out much lower down in the plains. These are both on the right or south bank of the river, where the slope or fall of the land is favorable for irrigation by flow or gravity.

The river Jumna is tapped by two large canals, taking out of it opposite each other, one on each bank. The eastern Jumna canal on the left bank is in the Northwest Provinces, and the Western Jumna canal, on the right bank, is in the Panjab Province. These also take out near where the river emerges from the lower hills into the great plains. Another canal, the Agra canal takes out below the city of Delhi.

While these canals irrigate every year a large area, many cultivators taking canal water regularly for the more valuable crops, such as sugar-cane or rice, which require water for a longer period or in greater quantity than the rains supply; still a very large area of land within the tract of country commanded by the canals is cultivated in

most years by means of the rainfall alone, or with the assistance of wells, ordinary grain and fodder crops being grown. But whenever the rainfall is deficient much of this land takes canal water in order that crops may be sown or matured. The people have only to send in a written request to the engineer in charge of the canal for water for their land, and arrangements are at once made to supply the water, as much more being taken into the canal at its head from the river as may be required, up to the full carrying capacity of the canal, or the quantity available in the river if this is less. In such years, the area irrigated by a canal and the revenue received from the water rates assessed thereon, are largely increased above the average; and the canal returns a satisfactory income to the Government besides averting the loss that would be caused by the land being thrown out of cultivation for a time.

The great rivers, from which the canals of North India are supplied, have their sources far back among the high snowclad ranges of the Himalaya Mountains. During the generally constant and often heavy rains of the rainy season, from the middle of June to the middle of September, these rivers are in flood. After the cessation of the rains they are at their lowest level and with their least volume of water. The cold weather rains from December to February cause them to rise a little for a time and sometimes produce freshets in them for a day or two; but they fall again very soon when those rains have ceased. At the same time more or less heavy falls of snow take place in the higher mountains. In the beginning of March, when the power of the sun appreciably increases, these snows begin to melt and cause the rivers to rise gradually. As the season advances and the heat increases, the snows melt faster, so that the continual rise of the rivers is steadily maintained until the rainy season begins, by which time the snows are largely exhausted. This rise is at the rate of from 1 to 2 or 3 feet a month during March, April and May; and by the time the rains begin the rivers are from 3 to 6 feet higher than their cold weather level. During the rainy season heavy falls of rain in the hills cause floods to come down suddenly, making a river to rise sometimes several feet further in one day. These fluctuations are frequent throughout the rainy season. The greatest floods produce a rise in a river of from 10 to 16 feet above its cold weather level, in its course through the plains, while its width is increased from less than a quarter of a mile to as much as 4 or 5 miles in the case of the largest rivers, and the volume of water is increased nearly one hundred fold.

These rivers are peculiarly well adapted for feeding irrigation canals. They are high throughout the hot weather months, when water is most in demand, and give then a practically unlimited supply,

far in excess of what is required for irrigation. During the cold weather less water is required, and the whole supply of a river is often dammed up at the weir and taken into the canal or canals taking out of the river above its weir.

As, however, the beds of the rivers are pure sand to a great depth, there is a large underflow below each weir, and this comes out on to the river bed again at some distance downstream, again forming a flowing river, though of greatly diminished volume.

In years of drought, when the rains in the plains fail, the rainfall in the Himalaya mountains, though very much less than usual, is still always in sufficient quantity to make the rivers rise and give them a fairly good supply, more than enough to fill to their fullest capacities all the canals at present constructed and supplied from them. Hence the first canal along a river never suffers from want of water during the rainy season; others lower down its course, where there are no weirs to raise and impound the water, may receive a less supply than usual owing to the river level being lower than in years of good rainfall, but the river supply is not all utilized. Such canals are small and occur in series and will be described further on as Inundation Canals. A weir cannot be provided for each one, as the cost would be out of all proportion to the benefit to be gained, and is absolutely prohibitive. But the question of amalgamating a series of these canals and giving them all one head with a weir in the river, is now coming under consideration in the Irrigation Department of the Panjab as a practical scheme.

(TO BE CONTINUED.)

STORAGE RESERVOIRS.

SPEECH OF HON. FRANCIS G. NEWLANDS, OF NEVADA, IN THE HOUSE OF REPRESEFTATIVES.

Mr. Chairman, when the chairman of the Committee on Rivers and Harbors was speaking I interrogated him regarding the following item: "Reservoirs at the headwaters of the Mississippi River: For continuing improvement, $300,000." I asked him what purpose those reservoirs served. His answer was that they were supposed to serve the interests of navigation; that they were on the headwaters of the Mississippi and were intended to increase the flow of the water during the summer season, but that in his judgment legislation with reference to this matter had been unwise and inefficient to accomplish the purpose intended. I have since inquired of the gentleman who represents Minnesota, and he informs me that for a distance of nearly 200 miles the flow of this river is materially increased by these reservoirs, that the water is 8 inches higher than it otherwise would be, and you all know what that means with flat-bottomed boats on the headwaters of these great rivers.

Now, Mr. Chairman, it is the view of the Committee on Rivers and Harbors that the appropriations reported by that committee should be confined entirely to navigation and that no items relating to irrigation should be inserted in a river and harbor bill. I submit that this is a narrow view of the jurisdiction enjoyed by this committee. The rules of the House refer to that committee all bills relating to the improvement of rivers, and I submit that a public work on a river, whether with a view to promoting navigation or irrigation, is an improvement of a river, and that the committee has jurisdiction of the subject-matter. This view has been taken by the Senate upon numerous occasions, and two years ago the Senate conferees strenuously though unsuccessfully insisted upon an amendment to the river and harbor bill which was intended to provide for the construction of reservoirs at the headwaters of the Missouri River, with a view of producing a steadier flow of that river to the Mississippi, into which it emptied. The interests of both navigation and irrigation can oftentimes be met by the same improvement.

What improvements are required in our rivers? In the first place the navigable rivers are subject to floods, and we seek to prevent the overflow by constructing levees. Immense sums have been expended

on the lower part of the Mississippi in an effort to confine the stream and to prevent overflow of the adjoining land. Another character of improvement is the dredging of the rivers for the purpose of meeting the period of drought in the summer when the rivers are low and when bars and shallows obstruct navigation. The flow of the lower Mississippi is increased by the flow of the rivers tributary to it. Some of them, like the Ohio, taking their source in the humid regions, and others, like the Missouri, the Arkansas, and the Platte, taking their source in the arid regions from the snows of the mountains, and it is contended that by storing the flood waters in the mountain regions, caused by the rapid melting of the snows in the Spring, a large proportion of the flood in the Missouri and the Mississippi rivers can be prevented and a more equal and sustained flow of the rivers thus promoted.

It should be remembered that the waters stored in these reservoirs are not the only waters which will be held back during the flood seasons. The character of all the mountain streams in the arid region is that they are torrential during April, May and June and that they are reduced to almost nothing in the following months. Large areas of arid lands lie within reach of these streams, but the condition of the flow during the hot months of July, August, and September limits the area of reclamation; for whilst the waters of the early spring and summer months is sufficient for the requirements of vast areas of land, yet if the waters were diverted over them and crops were planted, they would lack water at the period of greatest want when the crops were ripening for harvest.

The storage of water above enables a larger utilization of the flood waters which are unstored, and storage insures a supply during the period of greatest drought. The result would be that for every acre-foot of flood water stored there would be four or five acre-feet of flood water taken out over the arid lands, thus diminishing the flow of the streams tributary to the Missouri and Mississippi during the torrential period, and these great plains, now arid, would themselves be made the storage reservoirs of vast quantities of flood waters which would otherwise rush down to the Mississippi, so that effectual storage will not be confined simply to the artificial reservoirs, but will be extended to these large areas of land which will be reclaimed and which will absorb annually a volume of water at least two feet deep over the entire surface. The diversion and overflow of flood waters over the arid lands above would diminish the overflow in the Lower Mississippi and would diminish the cost of the levees intended for protection of the adjoining lands. The water carried over the arid lands above would penetrate the soil and would seep gradually back to the rivers and keep the streams below fuller during the hot month

than they would be had not this water been diverted or stored. Thus a saving will be effected in the dredging of the shallows intended to relieve as against low water as well as in the construction of the levees intended to relive as against flood water.

We content that by the construction of storage reservoirs at the head waters of these rivers in the rocky mountains a large proportion of the expenditures for levees on the lower Mississippi will be saved and that a more equal flow of the main river will be maintained, and thus the expense of dredging during the hot season will be greatly diminished. Navigation, like irrigation, requires that the streams should maintain an equal flow; that they should not be torrents at one season and attenuated threads at another.

The evils which attach to both navigation and irrigation are the same, viz., that the streams are overflowing at a time when the water is not needed and they are attenuated threads at a time when the water is most in demand; and we of the arid regions contend that both navigation and irrigation can be promoted by the storing of these waters at the sources of these mountain streams which are tributary to the great navigable rivers.

We also contend, even assuming that the river and harbor bill should be confined to improvements essential to navigation, that the proper place for appropriations for storage reservoirs on the rivers tributary to our navigable rivers is in the river and harbor bill, as they tend to promote navigation, although having a very much larger value in the promotion of irrigation.

But all the rivers in the arid region are not tributaries to navigable rivers. Upon what theory, then, should the Government proceed to store water on such rivers? Our contention is that irrigation is a public use, just as navigation is; that it is subject to the control of the law, and that the congress of the United States, under the "general welfare" clause of the Constitution, can do anything in the way of internal improvement that is calculated to promote the general welfare, and that the general welfare is promoted by maintaining an equal and sustained flow of a stream for irrigation as well as by maintaining it for navigation.

Besides this, the United States Government is the owner of 600,000,000 acres of land in the arid region, of which 100,000,000 acres can be reclaimed by a gradual process of storage extending over fifty or one hundrod years. The reclamation of these lands will make more valuable the remaining pastoral lands, which are now used in common by all the stock-raising interests in the West. The Government undoubtedly has the power to look after its own property—to survey it, to mark it by section posts, and to put it in condition for settlement and sale; and if the maintenance of an equal flow in the rivers running

through its lands is essential in order to enable its lands to be reclaimed by settlers, it can take such measures as it deems advisable for the purpose of making the waters available to settlers.

Large areas of lands along these rivers have already been taken up by settlers. and they have been able to solve the easy problems of irrigation, consisting simply in the diversion of the waters over the adjoining lands, but they are not able to control the torrential flow which has its source perhaps hundreds of miles away from those settlements, nor have they been able to store the water so as to maintain the supply during the hot season of July and August, when water is essential to the ripening of the crops. The limit of reclamation and settlement has been reached unless the Federal Government, acting, as it can, without regard to State lines, makes a scientific study of each river and its tributaries and so stores the water as to prevent the torrential flow in the spring and to increase the scanty flow in the summer. By doing this its arid lands will be made available for settlers, and it can, if it chooses, secure compensation by a charge upon the lands.

It is estimated that there are about 600,000,000 acres of arid public lands in the West, and of this about 100,000,000 acres can be reclaimed if storage is afforded. It is also estimated that the storage of water will cost from $2 to $10 per acre-foot; the average probably would be about $5 per acre-foot. The cheaper forms of storage would doubtless be attempted first, and the more expensive forms of storage would only be taken up years hence, when the pressure of population and the increased value of the lands would warrant the expenditure.

A convenient argument against the immediate prosecution of this work is that we have no estimate of its ultimate cost. Our answer is that if the Government had halted at the threshold of any great public work for inquiry as to what the prosecution of like work would cost within one hundred years, the estimate would probably have paralyzed the action of Congressional bodies. For instance, when the first river and harbor bill was introduced, suppose some captious member of Congress had demanded a halt until it could be ascertained what the total cost over a period of one hundred years would be. I imagine that the statement, verified subsequently by events, that in one hundred years nearly $400,000,000 would be expended on the river and harbor bill would have staggered the imagination, and yet this amount has been expended and the country has not felt it.

It is impossible to forecast the future and state exactly what the storage in the arid regions will cost; but assuming that 100,000,000 acres of land are to be reclaimed; that this land on an average will require annually 200,000,000 acre-feet of water, and that at least four fifths of this will be supplied by the flood stream, and that one-fifth

will be supplied by the stored water, we will require within the next fifty or one hundred years a storage capacity equal to 40,000,000 acre-feet of water—that is to say, a storage equal to covering 40,000,000 acres 1 foot deep, or 1,000,000 acres 40 feet deep. Assuming that the average cost of this would be $5 per acre-foot, the total cost would be within a period of fifty or one hundred years about $200,000,000.

Expenditures of the settlers upon their lands would far exceed this; it would probably average from $10 to $40 or $50 per acre, dependent upon the cost of the main canals, the level or broken character of the ground, and the difficulty in leading out the water from the river. But thing is assured, and that is that every acre of land reclaimed would be worth at least $50, and, as 100,000,000 acres are to be reclaimed, we would have a total increase in the wealth of the country in land alone, without improvements, of $5,000,000,000 by the expenditure upon the part of the Government of $200,000,000, and we would have a country opened up for the surplus population of the East and the middle Western States.

There are two ways of legislating upon this work. One is to pass annually a bill similar to the river and harbor bill, providing, first, for the construction of projects which have been surveyed, estimated, and reported favorably, and, second, making appropriations for surveys, estimates, and reports as to projects that are contemplated. Such appropriations would come out of the National Treasury and would be raised from general taxation, just as the appropriations in the river and harbor bill are.

Another method would be to fasten the cost of the Government work of storage upon the public lands susceptible of reclamation. Such a plan would involve the creation of an arid land reclamation fund in the Treasury, into which all moneys received from the sales of public lands in the arid and semiarid States would go. The receipts from the sales of public lands last year amounted to about $3,000,000, and including commissions and fees, to $4,000,000. So the sum available for the first year would be about $4,000,000. Provision should be made for investigation, surveys, estimates, and reports by the Geological Survey of various projects, and upon approval of a project by the Secretary of the Interior he should be authorized to withdraw from entry the lands in the reservoir sites and to withdraw from entry, except under the homestead act, all land susceptible of irrigation by reason of such project. He should then be given power to contract for the work; no contract to be made unless the money is in the fund. When the project is completed the total cost should be ascertained, and the price of the lands susceptible of irrigation and of the water rights attached thereto should be so fixed as to compensate the fund

in ten annual installments, thus maintaining the perpetuity of the fund for progressive work.

If the report should show that lands already setlted required stored water, power should be given the Secretary of the Interior to sell water rights to such settlers upon the same terms as to new settlers. Right of entry under the law should be limited to 80 acres, and the sale of the water right to existing settlers should be limited to an amount sufficient for 80 acres; the purpose of this being not only to prevent the creation of monopoly in the lands now belonging to the Government, but to break up existing land monopoly in the West by making it to the interest of the owner of a large tract of land made more valuable by the possibility of securing stored water, to divide up his land and sell to actual settlers. The bill should be so framed as to make its operation automatic, progressive, and complete, to guard against improvident projects, to prevent land monopoly, to secure homes for actual settlers, and to promote the division of the large tracts of land which, under the unfortunate administration of State and national laws, have been created in the West.

Under this plan the West would reclaim itself without calling upon the general taxpayers for a dollar.

It has been suggested that the cession of the arid lands to the States would produce the same results, and would relieve the Federal Government of a great work. My answer to this is that the Government has no right to abdicate the great trust imposed upon it by the ownership of 600,000,000 acres of land, upon which the homes of unborn millions are to be made. It cannot afford to intrust these lands either to the ignorance, the improvidence, or the dishonesty of local legislatures. The experience of all the Western States has been that the grants of land made by the Federal Government to the States for the purpose of education or local improvement have been maladministered and have resulted in the concentration of immense holdings of land in single ownership.

This country has to-day 70,000,000 of people; within one hundred years it will have 300,000,000 people. The pressure for land will be great.

Imagine the discontent and disturbance which will result from an improvident administration of these great areas easily capable of supporting 100,000,000 people.

Besides this, the physical conditions are such as to prevent States from dealing with this question. The arid region must be considered as a unit, regardless of State lines. Each unit should be a main river and all its tributaries. The plains to be watered may be in one State; the sources of the river which is to water them, and the only available sites for reservoirs, may be in an adjoining State. No State can act

outside of its own boundaries, nor can it clothe its citizens with sufficient power so to do.

The National Government, by reason of its national character, is alone capable of taking hold of this interstate question and solving it. Nor can this undertaking be intrusted to private or corporate enterprise. Storage enterprises are of such magnitude as to require immense capital. Their purpose is to bring about a union of the water with the land, and no corporation can successfully operate unless it has a grant of an immense area of land. This involves all the evils of land monopoly or subjects the enterprise to all the expenses connected with promotion, bond selling, etc. The speculative element must be entirely eliminated; the purpose is to create homes for the people, to make the waters of the West available for the reclamation of arid lands by actual settlers, and to eliminate entirely the speculator and the capitalist.

The cession of the arid lands would furnish no relief to the State of Nevada. Nevada is an impoverished State. It was brought into the Union just at the close of the civil war for the purpose of aiding in reconstruction legislation and before it had the population and wealth which is usually regarded as essential to the assumption of the burdens of statehood. It came in reluctantly. It was persuaded by the leaders of the republican party to accept statehood as a patriotic duty. It is true Nevada has produced more mineral wealth than any other State in the Union. It has produced $600,000,000 in gold and silver, more than one-fourteenth of the entire stock of gold and silver in the world to-day, and yet it has not profited by it; it is too near to San Francisco. The promoters of Nevada enterprises were San Franciscans and the profits went to San Francisco, where they built up stately edifices and inaugurated world-wide enterprises. But very little of that wealth was expended in anything relating to the permanent, substantial, and harmonious development of Nevada.

The railroad status also affected it unfavorably. As a rule transcontinental lines are built through uninhabited country, and then they build up that country by the promotion of settlement. The Central Pacific road was unfortunately involved in a controversy with the Government, and instead of pursuing the usual policy of building up the country which it traversed, the aim of its owners was to divert its business to the Southern Pacific, and to advance the region traversed by the Southern Pacific at the expense of the country traversed by the Central Pacific. It was contended that the Central Pacific was worthless, because it was built through a worthless State, and that Nevada was simply a good foundation for a bridge from Ogden, Utah, to California.

Then came the depressing effect of our financial legislation, which

resulted in the fall of the price of silver from $1.29 an ounce to 60 cents an ounce. You can readily understand that in mining enterprises, in which the operating expenses amount to from one-half to three-fourths of the gross receipts, a fall of over one-half in the price of the product of the mines would absolutely suspend and destroy silver mining. Prior to that time conditions were speculative. Farming itself was speculative, commercial life was speculative. Little was done during that period of tremendous mining output in the way of building the foundation of harmonious and proportionate growth. The result is, that under all these discouraging conditions Nevada has declined in population since 1880, while the population of the other intermountain States and Territories has nearly trebled. No one who is familiar with that region can contend for a moment that Arizona is equal to Nevada in its mineral or agricultural resources, but railroad and other conditions have been better there, and that territory has advanced from a population of 35,000 in 1880 to a population of nearly 150,000 to-day, while Nevada has declined from 65,000 to 45,000.

In addition, Nevada is in debt $300,000. It has reached the limit of its debt under the constitution of the State. How was that debt contracted? It was contracted when it was a Territory for money borrowed by that Territory in fitting out troops for the civil war—a war claim which has constantly been recognized by the Senate of the United States, but which has been rejected by this body.

Now, assuming that cession of the lands should be made to Nevada, how could she utilize them? The only thing she could do would be to turn them over to corporations and syndicates, and we would then have a repetition of the land monopoly which now so unfortunately exists both in California and Nevada as the result of grants to those States by the Government for educational purposes—a land monopoly which in itself prevents settlement and which ultimately will create indescribable discontent.

Then, again, the physical conditions of Nevada would prevent the utilization of such cession. Three of the most important rivers of the State—the Truckee, the Carson, and the Walker—have their sources in the Sierra Nevada Mountains in California. These rivers flow through the western part of the State into great lakes in the sink of the desert, where their waters lie unutilized. The problem is to prevent these waters from flowing into these lakes in the lowest part of the desert and to hold them back in the mountains above in artificial reservoirs.

The plains to be irrigated are in Nevada; the reservoir sites are in California. All the sources of the water supply of these rivers are in California. To cede the plains to Nevada and to cede these mountain lands to California would tend to absolute divorce between the water

and the land, and yet these waters are useless to California as there are no plains in California on the eastern slope of the Sierra Nevada Mountains. That region is entirely mountainous.

Now, the torrential flow of these rivers has increased in late years. Why? Because the Government has permitted these mountains to be denuded of their forests. The forests are the natural protectors of the great snow banks, which in themselves are natural reservoirs of water. If the forests remain, the snows melt much more gradually, and thus a more equal flow of the streams is maintained, permitting a wider extent of agriculture; but as these forests are destroyed and the snow banks are exposed to the fierce rays of the sun, the result is a great flow of water in the months of April, May and June, and no water when it is most required. The consequence is that the lowest flow of the streams limits the area of land that can be brought under cultivation. You cannot make your calculations with reference to the flood flow of the stream, because that is maintained only during the early months, and if you measure your reclamation by that flow your lands would be without water in July and August, and so it is that reclamation by private enterprise of lands adjoining these streams has been necessarily limited by their periods of lowest flow.

The problem is to prevent this water from flowing into these great lakes in the desert and to store them in the mountains in places naturally adapted for reservoirs, and thus maintain an equal flow of the streams throughout the agricultural season, instead of having a rushing torrent at one time and no water at another.

Nevada is reproached to-day because she is impoverished, and yet she is prostrated because the Federal Government has neglected its duty. Ninety-five per cent of the lands in Nevada are public lands, which pay no taxes of any kind for State or local government, and the owners of the other 5 per cent have to administer the laws and the police and the road building of the entire State. Nevada and Utah are similar in topography, in soil, and in general resources. They have an area equal to that of Spain. Spain is entirely cultivated by means of irrigation, except along the seashore. Spain supports 17,000,000 people. If a liberal policy were pursued in Nevada and Utah of preserving the forests, of conserving the flood waters, and utilizing the natural resources of those States, they could easily maintain an equal population. Within one hundred years this country will have 300,000,000 people, and the proper development of this arid country, the home of millions yet to come, should be an essential part of the govermental policy.

Now, I ask, who should undertake this work? Who can undertake the work? The view of the people of the arid region is that this is a public work of internal improvement which ought to be undertaken by

the Government of the United States. It resembles in character the old canals that were constructed years ago, or the interstate roads that were constructed by the General Government, or those improvements that have been made for a number of years in dredging our rivers and improving our harbors—public improvements intended for the general welfare; improvements from which the Government does not expect a direct reimbursement, but simply the general advantage that comes to the entire country and the general welfare from the promotion of enterprises of this kind. And inasmuch as the rivers of the arid region as a rule are not navigable rivers, and the only public use to which we can put them is irrigation, not navigation, we claim that a fair and equitable distribution of the benefits of Government requires that these streams should be maintained in equal flow by the system of reservoirs to which I have alluded.

But we also claim that this is not simply a governmental matter in the ordinary sense, but that the Government itself occupies the position of proprietor, pursuing the usual obligations of land proprietors, it is its right and its duty to put these lands in condition for settlement.

By so doing it can continue the traditional policy of the country, which has been to open up the public lands for settlement, restricting the number of acres to be granted to each individual, the purpose being to promote home building amongst a free people. And these arid lands have particular advantages for that kind of settlement; for if you will only see to it that moisture is applied to them by these artifical methods, you have the most scientific system of agriculture that can be conceived.

Mr. STEELE. Is there any timber at the head waters of those streams that would protect the banks?

Mr. NEWLANDS. Oh, yes; there are forests at the heads of these streams, though in some cases the forests have been largely cut down. Still, they protect in a great degree the streams, and our whole scheme involves not only the construction of reservoirs, but the preservation of forests by having a rational cutting of the trees instead of an indiscriminate and destructive cutting.

Mr. SHAFROTH. Allow me to state that the general character of all the mountainous regions where it is proposed that these reservoirs shall be constructed is that they are in timber. The snow which falls there is retained somewhat, yet not sufficiently retained to let it fall equally.

Mr. STEELE. I understood that that was the case generally, but I was not sure as to its being the case in Nevada.

Mr. NEWLANDS. It is true of the three streams I have spoken of in the western part of the State that have their source in the Sierra

Nevada Mountains. It is not true to the same extent of the Humboldt River, which takes its source in the eastern part of the State.

Now, the question is, Who should do this work? We claim that it is a matter of govermental and Federal legislation, and that in addition it is an obligation that rests upon the Government as the owner of these vast areas of public lands which can be opened up to settlement. As I was remarking, irrigation is the most scientific method of agriculture. We cannot determine the amount of moisture falling from the heavens; we cannot regulate it; we cannot control it. There may be too much; there may be too little. But as to water that is taken from a stream by a ditch, and distributed over lands at low level, there can be an absolutely scientific adjustment of the moisture to the requirements of the soil. When you have a rich soil and a sun that is kindly, if you add the necessary moisture, you have all the conditions of a most abundant cultivation—so much so that in that region 40 acres of land properly irrigated will sustain a family better than 160 acres of land in the Middle or Western States; and under certain characters of cultivation 10 or 15 acres of land will support a family.

Mr. MORRIS. Mr. Chairman, before the gentleman sits down I should like to ask him a question. The gentleman began his remarks by reading the item in the river and harbor bill providing for the reservoirs at the head of the Mississippi River and upon that he based the remarks which he has made. Does not the gentleman know that those reservoirs were constructed entirely for the purpose of increasing the navigability of the Mississippi River?

Mr. NEWLANDS. So I understand.

Mr. MORRIS. And therefore came within the rule laid down by the chairman of the Committee on Rivers and Harbors.

Mr. NEWLANDS. I understood the chairman of the Committee on Rivers and Harbors to say that these reservoirs were provided for the purpose of promoting navigation. I have also understood, however, that they were put there for the purpose of increasing the power on that river, but I may be mistaken as to that. However that may be, I still insist that when you can join the two uses, when you can pre vent the floods and increase the equal flow of these rivers by the storage of the water, you are promoting a purpose which is within the province of a river and harbor bill.

Mr. MORRIS. I simply want to correct the impression which may have been produced by the gentleman's remarks as to the committee having gone outside of its plan of making the bill.

Mr. NEWLANDS. Oh, no; I simply called attention to the fact. The reservoirs had been constructed there, and the reservoirs which we wish will serve the same purpose as those, for they will not only promote the reclamation of arid lands, but they will also tend to the maintenance of the equal flow of the streams.

CONVICT LABOR FOR ARID LANDS.

By E. H. Pargiter.

Under the above heading, in the July number of the Irrigation Age, was published a criticism by Mr. C. B. Parker on Senator C. H. Dietrich's proposal to employ the convict labour of the penitentiaries of the States on the construction of canals and reservoirs needed for the irrigation and settlement of arid lands in the Western States. In this article Mr. Parker takes exception to the proposal, mainly on the ground that there is to be had an abundant supply of free labor, thousands of men ready and willing to come and do the work; and that the claims of these men to be given whatever remunerative employment there is going must not be lost sight of or subordinated to other claims, in the otherwise reasonable and praiseworthy endeavor to improve the conditions under which our convicts at present labor. He also points out the most obvious difficulties and dangers to be met and overcome in safeguarding a large number of desperate criminals, and in preventing their escape or finding opportunities for further crime.

It has been well said that whenever it is proposed in America to undertake or attempt any new enterprise, in which Americans have had no practical experience, they look around the world to see where such an enterprise has been attempted or is being best carried on; they then make a thorough study of its ways and workings, to ascertain its good points and also its defects and failures, if any; and then, when starting it in their own country, try to go one better by continuing to avoid possible defects and by improving on previous methods. Now in this matter of the useful and profitable employment of prison labor on great public works, such as a large canal constructed in arid and almost uninhabited lands, North India furnishes us with examples in point, and so we can turn to it in our search for experience. This experience goes to show that under certain conditions there is ample room and there is a good opportunity for the useful and profitable employment of convict labor as well as almost unlimited free labor on such a work. The requisite conditions are, first, that a large amount of unskilled labor can be concentrated at one place and kept at work there for a considerable time; and, second, that a site and materials for housing them economically while at work at that place can be secured. On the large canals of North India these conditions are found at and near the head works of the canal. Here its channel is widest, and in deep digging giving a very large quantity of earthwork

in excavation in the first few miles; and there is also a great deal of work to be done in the river, on the weir, and on training and protective embankments or other works. It is the custom, then, in India to allot these works with the entire excavation of the first six or eight miles of the main canal to prison labor. A temporary jail is built in a central position within the length of work allotted and organized for the reception and maintenance of from 1,500 to 2,000 prisoners. with a trustworthy and fully qualified superintendent and staff of guards. The convicts are marched out every morning to their work and marched back every evening to the jail, where they can be securely housed for the night. They never have more than four or five miles distance to walk to their work, and seldom so much. There is enough work to employ them for several years around the jail; so that the expense of constructing it is fully repaid in the end by the value of the work done.

In the excavation of eight miles of a canal with a bed width of from 150 to 200 feet and with a depth of digging of from ten to twenty feet, there is sufficient work to employ 1,600 prisoners for some years. All their work is done by spade and barrow or basket; the soil dug out by spade is carried away either in baskets on the heads of men or in wheelbarrows: it is not the object to save labor by the use of machinery, but to employ as much labor as possible; the value of the work done by each man exceeding the cost of his maintenance, and so bringing in a profit to the Government, if possible. The convicts are secured against escape by having chains from the waist to the ankles; these prevent their running or moving fast, while leaving them quite free for work or for walking; and they are looked after by guards with firearms or other weapons. Any attempt at mutiny or escape can be promptly suppressed.

In India these temporary jails are built of adobe or sun dried brick, with the cheapest and simplest timber roofs, doors and windows, and the work of construction is mainly carried out by convicts brought to the place, and kept there, before the coming of the main body of convicts. When the work these men have been brought for is completed, they are removed to some other canal to be similarly employed there for the next few years. The adobe walls of the jail are left, and the useful timber either sold or removed for the next jail.

While convict labor is thus being employed, the whole of the remainder of the canal system, including several hundreds of miles of canal, branches, distributaries (Laterals), and all the buildings, bridges, or other works, is being done by paid free labor, usually on contracts. The Indian Government system allows of both kinds of labor being fully employed; for the system contemplates the con-

struction of many great public works, another being commenced as soon as one is completed.

For the same thing to be practicable in America, it is necessary that the Federal Government, which alone is able to do so, should arrange for the construction of large canals or reservoirs in arid lands, where all kinds of labor are required, and temporary sites for jails or penitentiaries can be obtained at no great cost. It would not be necessary to mass together so many convicts as can be done in India, but the requisite condition appears to be that they be employed sufficiently long in one place to render worth while the construction of safe quarters for them, where they can be securely housed every night. The safe-guarding of criminals is an essential feature of usefully employing them; and it follows from this that they be not required to work at such a distance from their quarters, as to prevent their going from and returning to them every day. A large reservoir might easily give a few hundred convicts employment for two or three years. Convict labor could thus be employed on large concentrated works, while smaller or more scattered works would be available for free paid labor.

The further question of rewarding convicts for good labor is beyond the scope of this article, which only attempts to show how, when and where convict labor may be usefully and profitably employed. But good use might well be made of the opportunities available for improving the status of a convict, and of holding out to him promises of reward for good conduct and faithful working to orders.

THE DIVERSIFIED FARM.

In diversified farming by irrigation lies the salvation of agriculture.

THE NEW BUREAU OF FORESTRY.

On the first of July the Division of Forestry and three other scientific divisions of the U. S. Department of Agriculture were advanced to bureaus. This was provided for by the last session of Congress, which appropriated for the expenses of the Bureau of Forestry during its first year $185,440. The appropriation of the Division of Forestry during the year just ended was $88,520. For the year 1898-99 it was $28,520.

These figures show how rapidly the forest work of the Government has expanded of late, and also how well it has commended itself to Congress. There was a time when the practical value of the scientific investigations carried on by the Government was not fully understood, and farmers were inclined to think that the money spent on experiment stations and chemical laboratories was of little benefit to them. Now the case is very different. The improvements in agriculture due to the work of the Department have increased the value of the farm products of the country by many millions of dollars annually. As this kind of work has proved its practical utility, Congress has shown itself generous toward it. The readiness with which Congress has increased the appropriations for the Division of Forestry is the best evidence that forestry has proved its importance from a business standpoint.

The change from a Division to a Bureau, and the larger appropriation, will make possible both an improved office organization and more extended field work. The Bureau will be provided with a much lager office force and will be organized in three Divisions. But field work, not office work, is what the Bureau exists for. This work has been going on during the last year from Maine to California and from Georgia to Washington. It includes the study of forest conditions and forest problems all over the country, the giving of advice to owners of forest lands, and the supervising of conservative lumbering operations which illustrate forest management on business principles. This work can now be greatly extended. Private owners of some three million acres have applied for this advice, which in every case requires personal examination, and about 177,000 acres have been put under management. This land is in many tracts, large and small, and is owned by individuals, clubs, and corporations. Several State governments have also asked the aid of the Bureau. But the greatest demand is that of the Department of the Interior of the National Government, which has asked for working plans for all the Forest Reserves, with the enormous total area of about 47 million acres.

FERTILIZING THE ORCHARD.

The orchards of this country are the most neglected of any of our crops. It may seem strange to some to call an orchard a crop, but that is what it is. It is growm for the purpose of producing something for use or sale just as other crops are, and it is a notorious fact that this crop is more neglected than any other we grow. Prof. L. H. Bailey, of Cornell, recently said some things about orchard management. He said:

Good drainage, natural or artificial, is essential to success. Trees are impatient of wet feet.

Good tillage increases the available food supply of the soil, and also conserves its moisture.

Tillage should be begun just as soon as the ground is dry enough in the spring, and should be repeated as often as once in ten days throughout the growing seasons, which extends from spring until July or August.

Only cultivated crops should be allowed in orchards early in the season. Grain and hay should never be grown.

Even-hoed or cultivated crops rob the trees of moisture and fertility if they are allowed to stand above the tree roots.

Watch a sod orchard. It will begin to fail before you know it.

Probably nine-tenths of the apple orchards are in sod, and many of them are meadows. Of course they are failing.

The remedy of these apple failures is to cut down many of the orchards. For the remainder of the treatment is cultivation, spraying—the trinity of orthodox apple growing.

Potash is the chief fertilizer to be applied to fruit trees, particularly after they come into bearing.

Potash may be had in wood ashes and muriate of potash. It is most commonly used in the latter form. An unusual application of potash should be made upon bearing orchards, 500 pounds to the acre.

Phosphoric acid is the second important fertilizer to be applied artificially to orchards. Of the plain superphosphates, from 300 to 500 pounds may be applied to the acre.

Nitrogen can be obtained cheapest by means of thorough tillage (to promote nitrification) and nitrogenous green manures.

Barn manures are generally more economically used when applied to farm crops than when applied to orchards; yet they can be used with good results, particularly when rejuvenating the old orchards.

BEET SUGAR IN MICHIGAN.

The Bay City Sugar Co., of Essexville, which has the largest factory of its kind in Michigan, has begun operations for the season. The beet shed has a capacity for 10,000 tons, and upward of 7,000 tons have already been delivered by the farmers.

There is excellent prospect of another sugar factory being erected at Essexville by outside capital. It will cost $1,500,000, and will be the largest sugar mill east of California.

It is proposed to utilize the Boyce, Penniman and Boutwell tracts of land, covering several hundred acres, underlaid with coal, which will be mined solely for the use of the mill.

IMPROVING FARM VALUES WITH IRRIGATION.

The universal use of irrigation in the West has practically revolutionized farm values in many regions. These methods of supplying the crops with water are many, but they all show an amount of adaption to conditions that proves the existence of Yankee genius here yet. There are more varieties of windmills for pumping up water than one could describe in a week. These windmills are not expensive affairs, but in most cases are built of ordinary articles picked up on the farm or in secondhand shops. They perform the work required of them satisfactorily, and that is all one can ask of them. The construction of a good working windmill on any farm, and a pumping attachment, with irrigation canals and reservoir, adds 100 or 200 per cent to the value of a farm in a region where summer droughts are heavy drawbacks to farming. With little extra work during the winter season it is an easy matter to make such improvements on almost any farm. The system can be

enlarged and extended season by season, and the farm gradually enhanced in value.

A farm that has a fair home-made irrigation plant is practically independent of the weather. The farmer is then sure of his crop no matter how hot or dry the season may prove. The great benefit derived from an irrigation plant is so apparent that it seems strange that so few are in existence. It is not always necessary to build a windmill for irrigation, for there are often natural advantages which any farmer can avail himself of. When brooks flow through farms they furnish in the winter and spring seasons an abundance of water, but when summer advances they often dry up and prove of no earthly good. The question of importance is how can such a stream be converted into use for irrigating the plants. It would not be so dfficult if a reservoir was dug and built on the farm, so that the water could be stored. Such a reservoir could easily be increased in size each year, and with the water stored in it, what would prevent digging ditches to carry the water to the fields when needed. Some will say that such work represents an immense amount of labor; but if the farmer intends to live permanently on his farm, will it not pay him to do a little toward the improvement each year, even though it may take ten years to eomplete the job? He can rest assured that he is increasing the value of his farm fully ten per cent every year, a fact which he will realize when he comes to sell it.—Professor James S. Doty, New York.

RECENT WORK OF THE DIVISION OF FORESTRY.

The result of the work of the Division has been to turn practical forestry in the United States from a doubtful experiment into an assured success. Special studies of some of the most important trees, commercially, have been made, from which can be calculated their probable future yield. Cheap methods of harvesting the present lumber crop without injuring the productivity of the forest have been put in operation. Such concerns as The Great Northern Paper Company and The Deering Harvester Company have been led to undertake conservative management of their forest properties. Meanwhile, the work of tree planting, particularly in the almost treeless Western States of the plains, has been furthered; the relation of the forest to the volume of streams, erosion, evaporation, and irrigation have been studied; matters connected with irrigation and water supply have been investigated; hopeful progress has been made in the direction of regulating grazing in the Western reserves in a manner fair both to the important interests of cattle and sheep owners and to those who look to the reserves as a source of continuous supply of wood and water; and studies of forest fires were conducted with a view of reducing the great yearly loss from this source. a loss which has been estimated at $50,000,000.

Field work is to go on this summer in 17 States There are in all 179 persons engaged in the work of the Bureau. Of this number 81 are student assistants—young men, largely college students, who expect to enter forestry as a profession, and who serve during the summer on small pay for the sake of the experienced gained.

PULSE OF IRRIGATION.

A Striking Contrast.

One of the members of the United States Geological Survey recently called attention to a striking contrast in the development of the country lying on each side of the boundary line between Oregon and Idaho. In southwestern Idaho, near Boise City and the state line, there is a considerable section well developed by irrigation. Owing to the combined advantages of the rich character of the soil, the favorable conditions of the climate and irrigation, this district contains some of the best fruit growing country in the world. Just on the other side of the state line in Oregon along the Malheu and Owyee rivers exactly the same conditions exist—rivers, soil and climate—with the exception of the application of water to the land by irrigation, the vital condition. In consequence this section, though but a few miles distant from the other and just as capable of high development, is a desert country. Here is the whole important question of irrigation in the arid West in a nutshell, with its homes, farms and industry; without it, a desert.

A Curious Result of Irrigation

Experienced irrigators of the arid lands of the West say that where the character of the soil is loose and sandy, as it is in many parts of the central valley of California and often elsewhere in the West, it drinks up the water put upon it in a most astonishing way. Thousands and thousands of gallons are run over and quickly absorbed by the thirsty soil when irrigation is first begun, and this may be continued for two or three years if the soil is deep. After several years of continuous soaking, however, during which time the ground has taken in great quantities of water, it reaches a condition approaching saturation, when it no longer needs more to make it suitable for crops, and the question may even become one of getting rid of the surplus. It is a well known fact that the country where Fresno, in Southern California, stands to-day, was originally a desert, arid waste where sheep had to scramble for a living in a good year and frequently starved to death in a dry one. To-day there are thousands of acres of land under cultivation there and the problem is no longer one of irrigation, but of drainage; and there is being now seriously agitated in the San Joaquin Valley the question of the construction of a great drainage canal to drain off the irrigating water. In the city of Tulare when the white people first went there, water could not be found in wells at depths less than 75 to 100 feet below the surface of the ground. To-day it is impossible to pump a well dry; it is even difficult to pump it down a foot; 10 or 15 feet below the surface the country seems to have become a great sponge. The reason for this rather surprising result of irrigation is that water introduced upon a given tract, sinks into the soil and in the course of years widely overflows its boundary, thoroughly moistens the adjoining lands and completely changes the character of the whole section. The significance of this result is that though at first investments in irrigating plants give returns for but a limited area, in the course of years the same plant will have opened up for occupation

and cultivation a much larger area than was originally expected. This view of the matter is interesting and suggestive of the possibilities of present irrigated lands in the next generation. Data concerning the conditions are being brought together by the Geological Survey as part of its investigation of the extent to which the arid land can be redeemed.

An Inter-State Complication.

An interesting complication, which has arisen in the growing demand for water in the West for irrigation purposes, was noted in a recent reconnoissance made by the United States Geological Survey in Western Nevada. This part of Nevada receives very little rain, and hence is a dry and unproductive land. But so wonderful are the possibilities of development in a seemingly dead country by means of irrigation, as has been illustrated time and time again in other sections of the West, that even this inhospitable tract could be brought under cultivation and made suitable to sustain a good population if developed by irrigation. But it seems that the rivers in western Nevada all rise on the eastern slopes of the Sierra Nevadas, on the Californian side of the line. Indeed, this boundary seems to have been originally drawn so as to include all the good land available on the east up to the border of the interior desert. Thus California controls the headwaters of these streams, and with all the conservatism born of imaginary lines, the Californian settlers are slow to allow the erection of storage reservoirs and irrigating plants which are needed to give the Nevada settlers the water they require.

Like everything else time will straighten out this difficulty, which is serious enough now, and Nevada will get its water, but the instance as an example of the hindrances in the way of progress is interesting and suggestive.

Brigham Young's Peaches.

In connection with the widespread and growing interest in the irrigation of western lands which, through the energy of the western people and the helpful cooperation of the United States Geological Survey is doing so much to develop the arid lands, the following information which has recently come to light regarding the beginnings of irrigation in Utah, will be of interest:

About fifty-four years ago the Mormons went into that territory, then dry and unproductive, and immediately began to improve it. They laid out Salt Lake City on a broad and comprehensive plan and, among their very first improvements, introduced water from the hills for use in their houses and gardens. Four years after they had become settled, or about the year 1851, President Fillmore sent a party of federal officers to take charge of the territorial government. Among them were the secretary and treasurer of the territory, judges of the supreme court and several Indian agents. The wife of the secretary, among many interesting remembrances of her stay at Salt Lake City, mentions the fact that the irrigating ditches used by the Mormons ran as they still do along the sides of the streets like gutters, and that through them constant streams of clear water were flowing. These ditches furnished the water for the gardens about the houses and was diverted wherever each householder needed to use his supply. On one occasion, the secretary's wife states, Brigham Young, with much pride, brought her one of the first four peaches which had ripened in his garden under irrigation, saying that he wished her to have the honor of eating it.

Irrigation Means Population.

The steady, persistent demand for government aid to make possible the extension of irrigating systems in the arid West is yearly becoming more and more uni-

versal. It is not a subterfuge of politics, but a real economic necessity. Nothing is more clearly brought out in the figures of the population of the various states, which the census bureau has just published, than the disparity in numbers of the population of the eastern and western states. Some of the comparatively small eastern states far outstrip their western sisters, which have room enough and to spare for half a dozen of them. Idaho, Colorado, Nevada with only one or two persons, or in case of Idaho only a fraction of a person, to each square mile territory is not a strong showing. To be sure these states have much land unsuited to the life of large populations, but there are millions of acres scattered along the river valleys which could easily be made habitable and extremely productive by the introduction of water to the dry lands. From all sides rises the cry for action. Nebraska has just had an enthusiastic irrigation congress; reports come from Texas and New Mexico of a scheme to use the waters of the Rio Grande; Colorado has an established example of the benefits of such work, and California owes much of her agricultural prestige to the reclaiming of her great central valley by irrigation. The western states are enthusiastic; the United States Geological Survey is helping, and there are sure to be beneficial results of a widespread national character.

Irrigation by Electricity.

Frederick H. Newall, chief hydrographer of the government geological survey, has given his unqualified indorsement to the plan for irrigating the arid West by electric power, and predicts that the innovation will add untold acreage to the irrigated land. The scheme seems feasible and should result in even more good than Mr. Newall now expects.

The plan is a very simple one, by which the water is made to generate its own distributing power. The streams in the mountains will be used to run the machinery at the powerhouse, and the electricity thus generated will be transmitted to the field below, where it can be applied to an electric motor operating a centrifugal pump which will lift the underflow from the stream to the surface and distribute it over the surrounding land as required. The farmer turns on his motor and the water flows. When he has enough he shuts it off and prevents useless waste.

The practicability of the scheme has been demonstrated by the number of plants already in operation in the San Joaquin valley, where it is claimed that the water is being pumped at a less cost than that of gravity ditches. Colorado presents many opportunities for installing plants in the canons economically, and the benefit will be widespread when such plants are installed. The ultimate development of this class of work must rest largely upon water conservation, the restraining of the spring flood to supply a continuous discharge during the summer months, keeping the power plants in operation as well as furnishing water for the ditches.—*Colorado Weekly Times.*

ODDS AND ENDS.

ABOUT THE INDIAN.

The total expenditure by the Government on account of the Indian service from March 4, 1789, up to and including July 30, 1900, has been $368,358,217, according to the annual report of Commissioner of Indian Affairs William A. Jones. The expenditures for the fiscal year ended last July amounted to $10,175,107. Of this amount at least $3,330,000 was devoted to the cause of Indian education.

The report reviews the changes in the system of the purchasing of supplies, by which the supplies are bought in open market shipped by common carrier at tariff or better rates, and estimates that this saves 20 per cent in cost.

Under the head of obstacles to self-support of the Indians, the report deprecates the ration system, annuity payments and the leasing of allotments. The ration system, says the report, is the corollary of the reservation system. The Indian population of the United States is about 267,900, of which 45,270 receive a daily ration. The ration issued and its value vary according to the tribe. Nearly two-fifths of the number receiving rations belong to the great Sioux nation. The ration has been gradually reduced the past few years, in accordance with the policy of the Indian bureau.

If the Indians' claim for full ratons as a right is conceded the commissioner predicts that the time when they will be self-supporting lies in the very distant fnture, if it comes at all. A number of Indians also are assisted by occasional issues and at several agencies the old and indigent are provided for. Altogether there are 57,570 Indians receiving subsistence in some degree, exclusive of Indian children in boarding schools. The Commissioner urges that the indiscriminate issue of rations should stop at once. The old and helpless, he says, should be provided for, but rations should be issued to the able-bodied only for labor, while those who have been educated in Indian schools depend entirely on their own resources.

Annuities distributed last year aggregated $1,507.543, the per capita ranging from $255 down to 50 cents. The report says that the large money payments to the Indians are demoralizing in the extreme. They degrade the Indians and corrupt the whites; they induce pauperism and scandal and crime; they nullify all the good effects of labor. Unscrupulous people induee the Indian to go into debt and then when the debt has accumulated and the Indian's credit is gone, pressure is brought to bear by the creditors upon the Government to pay the Indian so that he can pay his honest debts. The state of things growing out of the surroundings at the agencies is a scandal and disgrace.

There is now in the treasurey to the credit of the Indian tribes $33,315,955.09, drawing interest at the rate of 4 and 5 per cent, the annnal interests amounting to $1,646,485.96. Besides this, several of the tribes have large incomes from leasing and other sources. It is a safe prediction that as long as these funds exist they will be the prey of designing people.

The ultimate disposition of the Indian funds is a subject for the most serious consideration. In some cases they are small and in other very large. With respect to the former, they can, as a rule, be paid out to the Indians with little, if any, evil

consequences. With respect to the latter, their proper disposition is more difficult. It is admitted that great wealth is a source of weakness to any Indian tribe and productive of much evil. Two remedies have been suggested.

First—The gradual extension of these funds, setting aside a sufficient sum to maintain the reservation schools a definite period of years—say twenty-one—and then dividing the balance per capita and paying each member of the tribe at certain ages their share.

Second—As a corollary to this, division of the land belonging to the tribe per capita. The remedy proposed would almost invariably immediately relegate the Indians to proverty, though the remote result might be for them to work to save themselves from actual want.

The general leasing of their allotments by the Indians to white men is denouuced.

There were 250 Indian schools of all kinds conducted by the Government, and an increase of 1412 pupils in enrollment and 1142 in average attendance shown over the previous year. About 8000 of the 34,000 eligible school children are unprovided for. Compulsory education of the Indian children is strongly indorsed and Congress is urged to authorized the Commissioner to place every one of school age in some school, the selection of the school to be left largely to educated Indian parents.

The report controverts the commonly accepted theory that by constant contact with the whites the extinction of the Indian is only a matter of time. It says it can be stated with a great degree of confidence that the Indian population of the United States has been very little diminished from the days of Columbus, Coronada, Raleigh, Capt. John Smith and other early explorers. The first reliable Indian census was in 1870, and certainly since then the Indian population has been nearly stationary, whatever decrease there is being attributable to Indians becoming citizens.

Reviewing Indian Territory affairs, the report says there are 50,000 children of white parents there who should have schools, and that thousands of these children thus deprived of education are growing up in vice and ignorance, already filling the United States jails at Muscogee and other points with youthful criminals. The cost of education will not be excessive compared with results. School benefits also should be extended to the 4250 Choctaw freedmen. Government control of the schools in the Chickasaw Nation is advocated.

What's A Mule Fit For?

The question is so often asked by farmers who have never used mules on their farms, preferring horses, that we shall give a few of the merits possessed by our long-eared friend.

The mule is an easy animal to raise.

He doesn't eat much as compared with a horse.

An energetic mule will make a trip quicker than a horse, though he may not go fast—the secret of his speed is his uniform gait, steady and persistent.

You hardly ever see a sick mule; he seems practically immune from the diseases which attack horses.

A mule can endure more hardship than a horse, will pull more in proportion to his size, and will "stay with it" longer.

A mule is easier "broken," or trained to work than a horse, and is more reliable after initiated.

If a team of mules runs away they look out for themselves, and though they may make some close turns and go through a needle's eye, so to speak, they usually come out unharmed.

We would rather plow corn with a team of mules than with horses; they break down less corn and turn around quicker.

Hot weather affects the mule less than the horse.

A good, honest business mule is worth, and will command, a good price any day in the week.

The usefulness of a mule continues longer than that of a horse.

The mule is not handsome, doesn't make a good roadster, isn't stylish, doesn't "do himself proud" if hitched to a fancy yellow wagon or cart, but what he lacks in appearance he makes up in actual usefulness on the farm.—*Tennessee Farmer.*

The Mule and the War.

According to the terms of the injunction suit filed by the Boer representative at New Orleans, the success of the British in South Africa depends entirely upon their getting their regular supply of mules from the Louisiana metropolis. The complaint says that "the war can be carried on by Great Britain only through the renewal of its military supplies from this port (New Orleans), and when these supplies cease the war must end."

This is the most powerful tribute to the efficacy of the American mule yet recorded. Old soldiers of the civil war are full of reminiscences of the importance of the army mule in that struggle, and we know that he was a great factor in Cuba, and is so now in the Philippines. But no one ever before asserted that the ability of a great empire like that of Great Britain to carry on war depended upon the limited supply of mules that could be obtained from a single American port.

The indispensability of the mule in war operations may be freely admitted, but New Orleans is not the only port from which this sturdy, long-eared animal can be shipped. It may be "reckoned" that so long as Johnny Bull has money he will get a supply of mules somewhere.

The question as to whether the United States violates its neutral obligations by permitting the shipment of mules for the British from any of its ports, is a very important one, and if the New Orleans suit results in settling that, it will go on record as one of the most notable judicial proceedings in our history.

Mark Twain's Double.

There are in this country a number of clubs, situated in various cities, whose mission in life is to give good dinners and do amusing stunts after they are consumed. The parent of these clubs is the Clover Club in Philadelphia. Then there is the Gridiron in Washington, the Whitechapel in Chicago, the Tavern Club in Boston, and a number of others. Yesterday at the Murray Hill hotel, P. R. Dunne, of Boston, told of a recent meeting of the Tavern Club. "Samuel L. Clemens (Mark Twain)," said Mr. Dunne, "was the guest of honor. He had some other engagements that evening, and so he arranged with the club to come there after the dinner and make a speech. No one, however knew this save the managers, and, as the event proved, they kept the information successfully to themselves. When the dinner came off Twain occupied the seat of honor next to the host, and the dinner went smoothly on its accustomed course from oysters to coffee. Then came the speaking, and Twain made one of his very best efforts when his turn came. He had just finished when the door opened, and to the utter astonishment of most present there entered the exact counterpart of the last speaker. The two men were identical in appearance, and when the newcomer spoke it was noticed that their facial expressions were the same, as, too, were the intonations of the voices. The two Dromios could not have been more exactly alike, and the dumfounded members stared open-mouthed from one to the other, all at sea as to what it meant. The president of the club relieved the situation by introducing the two men. 'Mr. Samuel L. Clemens,' said he, suavely, referring to the most recent arrival, 'permit

me to present you to Mr. Mark Twain.' The last named advanced across the intervening space and grasped the real 'Mark Twain' cordially by the hand. "Believe me, Mr. Clemens, I am delighted to meet you at last,' he assured him earnestly. 'Throughout a long life I have been constantly taken—rather mistaken—for you. I am glad to meet you at last face to face. It is a privilege I had never expected to experience. When you have done ill in this world the blame has always rested on my shoulders (which, thank God, are broad enough to carry even that load.) When I have done well, you have received the credit.' And then the tumult broke forth. Of course, it was a hoax. The few who knew that Twain would be late had taken advantage of that fact, and had rung in a substitute. A fellow member had been so cleverly made up to look like Twain, and had so thoroughly enacted his part, that for a full two hours he had fooled a number of the cleverest men in Boston. Many of those present knew Twain well, and one or two were intimate friends.—*New York Tribune.*

A Juvenile Opinion.

Since ma's got Christian Science, us kids is dead in luck--
No hot old mustard plasters upon our chests are stuck;
She never puts no ginger upon the stove to boil,
Nor doses up us children with that old castor oil;
She just says: "Look here, children, no need for you to squall.
You think your stomach's aching?
There's no such thing at all."

Since ma's got Christian Science, she doesn't use a whip
To punish us, but simply takes puckers in her lip,
And thinks and thinks right at us, until she near goes blind,
And then she says she's whipped us by whipping in her mind.
That is the absent treatment, but any one can see
That it don't make connections with such a boy as me.

But pa—now he is dif'rent. When he's at home he'll say:
"You children best be careful not to be bad today."
And you bet we are careful, 'cause pa he says that he
Will give us switchin' science hot from the willow tree,
And, as for absent treatment, why he says, with a wink:
"I'll 'tend to all the switchin'—ma can stand by and think."
—*Josh Wink, in Baltimore American.*

Susan Van Doozan.

I'll write, for I'm witty, a popular ditty,
To bring to me shekels and fame,
And the only right way one can write one today
Is to give it some Irish girl's name;
There's "Rosy O'Grady," that sweet "steady lady,"
And dear "Annie Rooney," and such,
But mine shall be nearly original, really,
For "Susan Van Doozan" is Dutch.

"Oh, Susan Van Doozan, the girl of my choos'n!
You stick to my bosom like glue,
When this you're perus'n' remember I'm mus'n'
Sweet Susan Van Doozan on you;
So don't be abus'n my offer, and bruis'n
A heart that is willing to woo
And please be excus'n, not cold and refus'n',
Oh, Susan Van Doozan, please do!"

Now, through it I'll scatter--a quite easy matter—
The lines that we all of us know,

How "the neighbors all cry as she passes them by,
'There's Susan, the pride of the row!'"
And something like "daisy" and "setting me crazy"—
These lines the dear public would miss—
Then chuck a "sweetheart" in, and "never to part" in
And end with a chorus like this:

"Oh, Susan Van Doozan! before I'd be los'n'
One glance of your eyes of sky blue,
I vow I'd stop us'n' tobacco and booz'n'—
That word is not nice, it is true—
I wear out my shoes'n', I'm losing my roos'n'—
My reason, I should say, dear Sue—
So please change your views'n', become my own Susan,
Oh, Susan Van Doozan, please do!"

—*Joe Lincoln, in L. A. W. Bulletin.*

BACON AND GREENS.

The sweet songs of springtime are merrily ringing
Out on the soft breezes with musical swell:
The amateur poets are everywhere singing
In lines that sometimes rhyme remarkably well.
They sing of the birds that inhabit the bowers
The brooks that are babbling mid fair rural scenes,
The grass-covered meadows, the trees and the flowers,
But never a warble of bacon and greens.
O; that was the dish that our forefathers relished
When called in at noonday from field of their work—
A big dish of greens with its bosom embellished
With generous slices of country cured pork.
Their lips they would smack in extreme satisfaction,
Unloose the top button that served on their jeans
To give them more room when they got the right action
Upon the loved layout of bacon and greens.
The women their faded sunbonnets would tie on,
And seek for the treasure in lane and in wood,
The tender young mustard, the sweet dandelion,
And other green things that they knew to be good,
From out the great pot they the fruit of their labors
Would stack for the feast in the waiting tureens,
The fragrance borne forth telling all of the neighbors
The tale of the dinner of bacon and greens.
New Yorker's may dine on hot birds and cold bottles,
The Jerseyites feast on the succulent clam,
Chicagoans send down their ravenous throttles
Most liberal swallows of home-doctored ham,
St. Louis may feed on corn pone and molasses
The Bostonese revel in brown bread and beans,
But none of these foods fit for angels surpasses
The old-fashioned fillin' of bacon and greens.

—*James Barton Adams.*

WTH OUR EXCHAGES.

SATURDAY EVENING POST.

Baron Munchausen was the first traveling man, and my drummer's expense accounts still show his influence.

Adam invented all the different ways in which a young man can make a fool of himself, and the college yell at the end of them is just a frill that doesn't change essentials.

It't the fellow who thinks and acts for himself, and sells short when prices hit the high C and the house is standing on its hind legs yelling for more, that sits in the directors' meetings when he gets on toward forty.

Pay day is always a month off for the spendthrift, and he is never able to realize more than sixty cents on any dollar that comes to him. But a dollar is worth one hundred and six cents to a good business man, and he never spends the dollar.

If you gave some fellows a talent wrapped in a napkin to start with in business, they would swap the talent for a gold brick and lose the napkin; and there are others that you could start out with just a napkin who would set up with it in the dry goods business iu a small way and then coax the other fellow's talent into it.

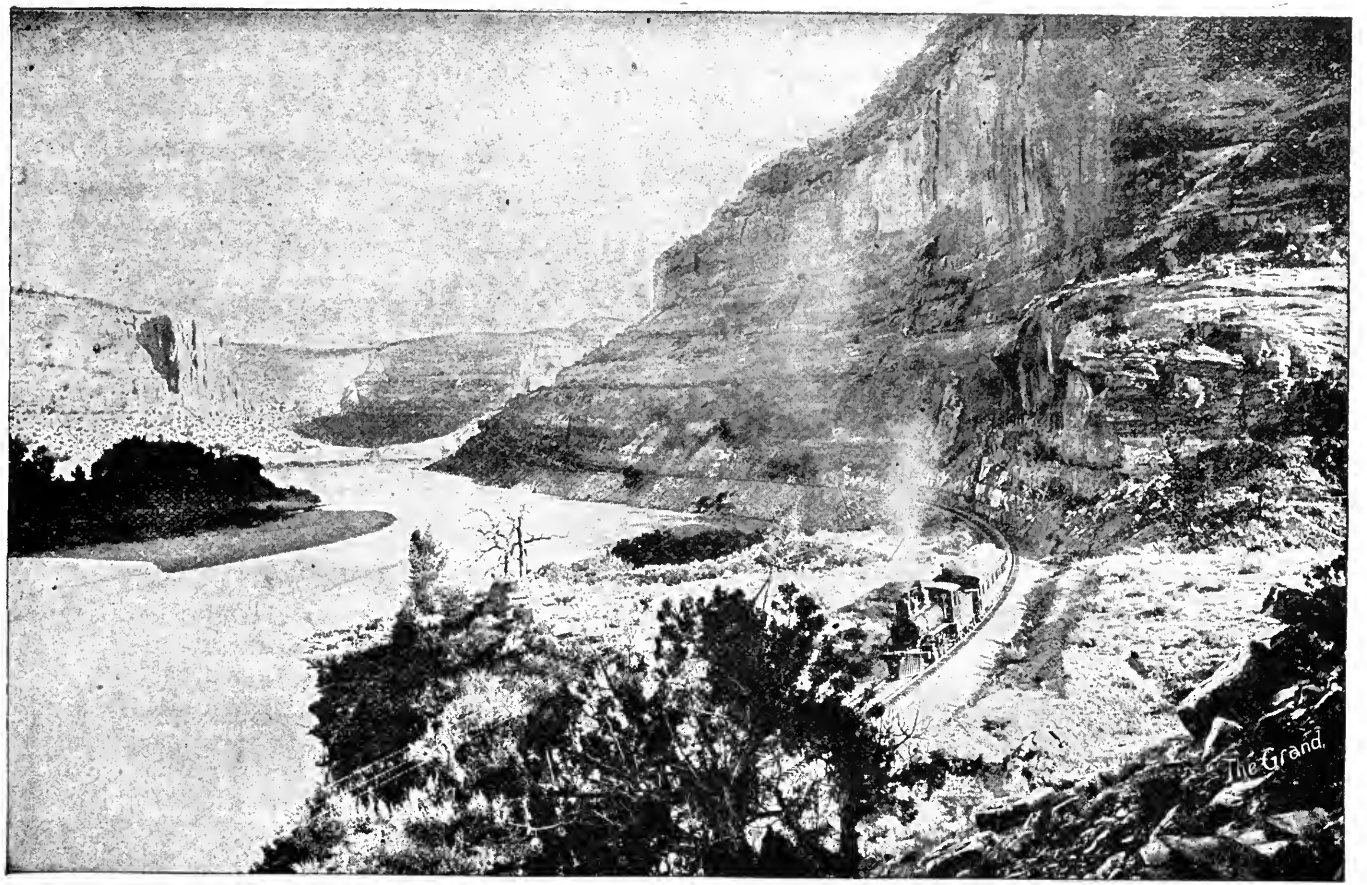
I alwrys lay it down as a safe proposition that the fellow who has to break open the baby's bank for car-fare toward the last of the week isn't going to be any Russell Sage when it comes to trading with the old man's money.—*From the letters of a self-made merchant to his son, now appearing in the Saturday Evening Post.*

LADIES' HOME JOURNAL.

Evidently no effort has been spared to make *The Ladies' Home Journal* for August a positive boon to its readers during these warm midsummer days. Its light, readable articles, bright stories, clever poems, charming music, and numerous beautiful illustrations afford the easiest and pleasantest kind of entertainment for leisure hours. Enchanting views of the lovely scenery in the Engadine Valley and among the Swiss and Italian lakes, as well as such delightful articles as "The Singing Village of Germany" and "What Girl-Life in Italy Means," allure the thoughts to foreign lands, while there are timely suggestions about "the Picnic Basket," "Keeping a House Cool in the Dog-Days," and "Sea-Side Toys and How to Make Them." Other thoroughly interesting contributions are "The First White Baby Born in the Northwest." "My Boarding-School for Girls," and the usual serial and department articles. By the Curtis Publishing Company, Philadelphia. One dollar a year; ten cents a copy.

SCRIBNER.

For September contains "The Wrong House," by Raffles; "The United States Army," by Gen. Francis V. Greene; "The Clock in the Sky," by Geo. W. Cable; "The Voice of the Sea," by Thomas Nelson Page; "A Burro Puncher," by Walter A. Wyckoff; "The Poor in Summer," by Robert Alston Stevenson.


The Grand.

THE IRRIGATION AGE.

VOL. XV. CHICAGO, SEPTEMBER, 1901. NO 12

The Draught an Eye Opener The experience of the present year because of the drought will be liable to change the views of some of our congressmen in regard to irrigation. Missouri farmers are losers this year by $100,000,000, Kansas as much more, Nebraska nearly as much, while Arkansas and Iowa are heavy losers. They are pointing to the great results of irrigation in Colorado and other states, and are now willing to concede the benefits of irrigation.

Plenty of Water. Prof. Newell says that the water power in the Yuba river is picked up by electricity and made to light even the city of Stockton, more than one hundred miles away. But on the way, where the wire crosses the valleys, the farmers run pumps by it to irrigate their lands. Now, while it would be most difficult to turn many Eastern rivers into canals through which to irrigate the soil, it would be comparatively easy for the farmers to join and obtain power enough from many of the streams to run pumps to irrigate vast areas of land, and in that way we expect the first efforts toward extensive irrigation will be made in that region. That will interfere with no riparian rights; it will foul no streams, and when the irrigation season is over, the power can thresh the wheat, bale the hay, saw the wood, light the house and stables, and farming will be exalted.

In the same way we suspect that mighty areas of desert in the arid belt will be brought under cultivation, for, as a rule, there is plenty of water below the surface of our desert lands. The Snake river can supply power to run a million pumps, and there is water power enough in Utah to turn a world. The next twenty years will make a transformation in this West, and this year's sorrowful experience ought to quicken the minds of Eastern people to cause them to try never to be quite as badly left again as they have been this year.

Reclaiming the Zuyder Zee. A recent dispatch from The Hague indicates the enterprise of the Hollanders in the matter of land reclamation. The government, it is stated, has introduced a bill in parliament for the reclaiming of 113,666 acres from the Zuyder Zee, at an estimated cost of 95,000,000 florins. The scheme will add 2,000,000 florins, or about $800,000, to the budget annually for the next fifty years.

The Nile Dam. The erection of the Nile dam by the British Government will form a lake with a capacity of over a billion tons of water. When the sluice gates are open, while the Nile is at high water, something like five million tons of water will rush through every hour.

Irrigation in Canada. Irrigation is rapidly coming to the front in the region of light rainfall in Western Canada. Some 660,000 acres of land were reclaimed during the past year, and canals were constructed to the length of 525 miles.

The Prospects of Irrigation. Great will be the glory of the West when she shall have attained to her full stature through the re-

clamation of her arid domain. It is now very generally conceded that a national irrigation policy is the only means by which such a result can be effected. The growth of this movement throughout the country has been a phenomenal one during the past few years.

The national movement is now of such magnitude that it is gaining strength of its own impetus. We failed to get our appropriations from the recent Congress, but that is not as much our fault as it is due to insufficient time afforded by the short session of Congress. Notwithstanding, we have taken a long step forward and I am confident that at the next session there will be enacted a great part of the legislation we require.

The best evidence of this feeling is that only two years ago Congress laughed at the idea of a national irrigation law, but during the last session it was conceded to be a mere question of time. I have talked with many Congressmen who will not say they are in favor of the movement, and with many who are openly opposed to it as it stangs now, and they have told me flatly that if we would seek direct legislation and appropriation instead of pursuing the course of tacking our measures on the general appropriation bill in the form of amendments, they would stand with us. They one and all admit that it is a question of a short time when an irrigation act will be put through. The bills favorable to us, which were returned from committee this winter, came before the House two days before adjournment and consequently too late.

My own conclusion and judgment is that our absolute success is merely a matter of organization. If well organized now I am convinced that our policy will be fully inaugurated at the next session. If we are apathetic we may lose all we have gained. Our strongest opponents are eastern agriculturists, who believe erroneously that western development will result in disastrous competition, and an even stronger class that believes the Government domain should be ceded to the States and the States forced to stand the expense of reclamation—something few States, if any, could afford to do.

Untiring work and effort must be the keynote of the work.

Increased Interest in Irrigation. It is surprising to note the interest the metropolitan papers take in irrigation in the West and the conservation of the flood waters which run unchecked to the sea. This should lead to an education of the people in correct lines, and result in beneficial and needed legislation. That it is more and more the subject of editorial comment in the city journals is a cause of congratulation. The time should not be far distant when every irrigation possibility will be utilized to the utmost capacity. An ancient civilization has recorded in our Southwest its belief in irrigation, and if any one doubts its value let him read the lesson taught by the ruins of great cities and mighty peoples, once living where now a desert reigns supreme. Until we equal the record of the past, an education is needed in irrigation matters.

Chinese Canals. In the great Empire of China, notwithstanding the vast antiquity of her alphabet and records, the distribution of water by canals dates back into the fabulous period. Forty centuries of recorded history do not describe the methods first in use which even then were old. Chinese irrigation of to-day, though entailing enormous labor, yields three full crops a year and the soil asks for no interval of rest.

A thousand years before the birth of Christ, the Chinese record has it, the Wou-Weng caused to be constructed hydraulic machines of simple design and working, which were successfully used for filling storage reservoirs, and as a consequence agriculture flourished. Some 800

years later, or about 250 B. C., the great Teheng-Ko canal was constructed to divert the waters of the King River, by which fully a million acres of arid land were made highly productive. This, Chinese history states, so increased the wealth and enriched the monarch that he was enabled to transform his Kingdom into an Empire.

The Wealth to Come.

"In the new West," said Mr. Wantland in his address at the Transmississippi Congress at Cripple Creek, "the main lines of railway are already provided. The pioneer lines were not constructed because the products of the country they crossed justified the expenditure. There were profits in the days when the first trans-continental road was built. This was done when the great possibilities of the West were only talked of by dreamers; now, 'All wise men agree that beyond the Mississippi lies the great wealth of the days to come,' and the prophets of today tell us that the great trade to be developed in the lands beyond the Pacific will call for all the grain which can be raised in the irrigated valleys of the Pacific Coast states.

"In a report to the 56th Congress on the Free Homes Bill, the Committee on Public Lands said:

" 'No legislative enactment ever placed upon the statute books of the nation has been more lauded than the free homestead law of the United States. Under its beneficent provisions the hardy sons of New England, the thrifty young men of the middle and western states, and the sturdy immigrants of the Old World poured into the fertile, unoccupied regions of the West, and by the labor of their hands they transformed the forests into fruitful farms and changed the almost limitless plains of prairie grass into billowy fields of waving grain. Cities and towns sprang up in this territory as if by magic, churches and schoolhouses are found at every crossroads, and no more valuable and loyal citizens can be found in all the commonwealth than the original homesteaders and their descendants. It was a poor man's law; poor men availed themselves of its advantages, but the fabulous wealth they have created for themselves and the nation is beyond computation.'

"The arguments in favor of paying a few millions of dollars to Indians in order that additional lands in reservations could be thrown open to homestead entry free apply with double force in favor of appropriations by congress to assist in the reclamation of arid lands farther away from the great centers of population in order that home-builders may be given an opportunity to make a living in the mountain and Pacific Coast states, where irrigation is necessary.

"If it is good policy to buy off Indians and open the 12,000 homestead tracts in Oklahoma, for which 100,000 struggled, the business men of the West may consistently urged that it is right to put water upon 40,000,000 acres of arid lands, upon which a million families can raise grain and fruit on forty-acre farms. But unless the merchants and manufacturers and heavy taxpayers of the West realize that it is their burden, and get behind the efforts of the National Irrigation and other associations working for improved conditions, many of us will be a long time dead probably before the western members of congress will get together and secure the necessary strength to push through congress the needed legislation.

"Trade follows the flag, but it also follows the irrigation reservoir and the ditch, if they carry water at the right time.

"If organization can be substituted for talk; surveys for theories, reservoir building for resolutions, and the homeless from other states be brought into our valleys and given a chance to build up homes under favorable conditions, then we may justly claim it to be true that 'The West is the most American part of America.' "

Mining Development. It will not be contended by those who put forward the claim that the reclamation of the West through irrigation will work to the detriment of the eastern farmer; that it would benefit the farmers of New England, New York or Pennsylvania, if every human habitation west of the Alleghenies were blotted out of existence, and every farm in that great region made desolate in order to remove competition.

Those who have studied the resources and possibilities of the West realize fully that agriculture, as it will be worked out on the irrigated lands, is but an incident of the gigantic production of which the West is capable, and the possibilities of which are today really so little known. The mineral resources of the arid region are so vast, including the great production of oil, which is now beginning to be developed, that agriculture will be more a stimulus to mining development than anything else. In the arid West, where living and transportation as a rule are expensive, only the comparatively high grade ores can be profitably worked. The tremendous mining resources of the country can never be fully developed without cheap food and cheap transportation, and these the West will never have until it has irrigation. Nothing could possibly benefit the East more than the development of the wealth of the Western mines.

Windmill Evolution. The evolution of the windmill, from the huge clumsy machine of the fourteenth century, or from even the windmill of fifty years ago, to the present improved, light, rapid running but powerful form of today, has been as remarkable as any feature of irrigation development, and the American windmill of the present is no unimportant accessory to the great irrigation systems which are being year by year projected and completed throughout the West.

IRRIGATION IN INDIA AND AMERICA.

By. E. H. Pargiter, of the Irrigation Branch, Public Works Department, Panjab. India.

(Continued from last month.)

But after the cessation of the scanty rains in the mountains, in a year of drought, the rivers soon fall very low, and become quite insufficient to supply the demand for water from them. The supply that each canal obtains has to be very carefully distributed, and economically used, so as to allow of as large an area as possible, being irrigated. This is now done by running each distributary or branch, full, for a few days at a time; all getting thus a supply in rotation. This, fortunately, can easily be done during the cold weather months—as a rotation period of one month can be given, it not being necessary to water the crops then grown, oftener than once a month. During the hot weather months it is necessary to allow water to be given every fifteen days at most; but then the supply is ample, and can be given, usually, whenever wanted, without having to carry out any system of working the different branches in rotation in order to economize the supply.

Having already mentioned the canals supplied by the Rivers Ganges and Jumna, there remain in upper India those supplied by the five rivers of the Panjab, viz.: the Indus and its tributaries. Each of these rivers now has, or will in course of time have a large perennial canal taking out on its left or south bank, near where it commences its long course through the great plains; with a permanent weir across the whole width, able to dam up the whole cold weather discharge, if necessary, and turn it into the canals. Lower down the courses of these rivers in the very arid tracts of country in the South West Panjab, and in the province of Sindh, there are numerous small canals on both banks, called inundation canals, as they are chiefly designed to flow only during the hot weather months when the rivers are in flood. In Sindh some of these are large and important canals, and have a fair supply during the cold weather months also, so they are really perennial, not inundation canals, though usually classed as inundation canals, because their system of working more nearly resembles that of the latter, than that of the former.

Of the large perennial canals alluded to, three are completed and irrigating large tracts of country; the Bari Doab Canal from the River Ravi was first commenced, soon after the annexation of the Panjab,

and has been working for more than thirty years, though some of its branches were not ready till much later; then the Sirhind Canal from the River Satlej was taken in hand, and has been working for seventeen years; and next the Chanab Uanal from the River Chanab, just completed, though some branches have been working for several years. The next canal to be opened will be the Jhelam Canal, from the River Jhelam. This has been lately commenced, about three years ago, and is expected to take five or six years in construction from its commencement, before it will be sufficiently ready to be opened for irrigation.

The circumstances and designs of the first named of the above canals, are very similar, and show the site on a river that engineers in India 30 years ago considered it necessary to select for the head works of a large perennial canal. This site is the point where the river leaves the lowest mountain ranges, and enters the great plain of North India. Here the river bed is permanent, and narrower than in its course further down through the great alluvial plains in which, as the river when in flood erodes its banks to a large extent, a very wide bed has been cut in the course of centuries. The wier or dam across the river at the site selected, would be shorter than further down, while there is always an abundance of good building stone in the mountains close by, and the river bed is full of boulders of all sizes, admirably adapted for paving and flooring, and pitching (or riprapping) the sides of works and channels.

The disadvantage of such a site for the head of a canal, are, firstly, that for the first few miles of its course the canal is in very deep digging, and the cost of the large quantity of earthwork in excavation is considerable; and secondly, that the canal has to cross several hill torrent and drainage channels that fall into the river. The crossings are very troublesome and expensive to construct; and the subsequent training of the torrent channels leading to and from the crossings, needs constant attention and frequently a heavy expenditure on spurs and riprapping. These channels are usually dry, except immediately after heavy rain, when they are filled with a rushing, raging flood of water, the drainage from the lowest range of hills to the river. This water is heavily laden with sand and sediment, and cannot be taken into the canal for fear of choking it up with the sediment that would then be deposited. Also the amount of water brought down would often be much in excess of the capacity of the canal. Hence each drainage channel of any considerable size must be provided with a syphon crossing, to pass it under the bed of the canal; or with a super-passage, to pass it above, wherever the canal is in such deep digging that the bed of the torrent is well above the full supply level in the canal. The foundations of these syphons and

super-passages are necessarily very deep, and are always much below the subsoil water or spring level. Consequently, pumping to a very great extent, and sometimes for a long time, has to be carried out both before and during the construction of the foundations; entailing heavy expenditure.

Thus to counterbalance the smaller cost of the head and river works, there is the greater cost of the main canal channel, the long time occupied in its construction, and the heavy annual maintenance charges, besides the great inconvenience, or even danger, that would ensue on the failure or destruction of any syphon or super-passage, or the breaking into the canal of any torrent. Consequently, for the later designed large canals, such as the Chanab and Jhelam Canals, the sites for the head works have been selected much lower down the courses of the rivers, where there are no hill torrents to be crossed, and where, as the river bed is not very deep below the ordinary ground level of the land bordering it, the depth of excavation is not excessive, and there are no special difficulties to be overcome in the construction of the main canal. Though the length of the weir across the river is great, nearly a mile in the case of these two canals, and long lengths of strong earthen embankments are required, with much stone or brushwood pitching (or riprapping) on their slopes, wherever they have to meet the force of the stream, yet on the whole there are no special difficulties of construction or maintenance. Earthwork also in India is done very cheaply and rapidly; and thus, this system is found to be more satisfactory and to give less trouble, than the former one of keeping hill torrents under control, conducting the waters across the canal, and seeing them safely off the premises and on their way into the river.

Both the Sirhind and Bari Doab Canals are now valuable properties and sound investments, bringing in to the government a handsome net revenue, after paying all expenses of working, maintenance, and annual interest on the capital cost of their construction. As they commence at the foot of the hills, they first traverse for some 60 to 80 miles, the belt of country in which in most years of average rainfall, no irrigation is necessary, though here some irrigation is done by cultivators who grow the more valuable crops which require many or frequent waterings. The demand for water is comparatively small in ordinary years in these upper reaches of the canal; but should the rainfall be deficit, or too long delayed, the demand suddenly becomes great; and as it can be supplied, the area irrigated, and the revenue derived from the water rates assessed, are largely increased. The revenue of the canal in this tract may thus vary very considerably from year to year. South of this belt where cultivation is precarious or impossible without irrigation, the demand is always great, but may

be relieved for a few days or even weeks occasionally by a good general fall of rain. In these middle and lower reaches of the canal, the cultivators know they cannot depend on getting enough rain on which to sow and mature a crop; therefore they readily take canal water early each season before the rainy season commences, and are prepared to pay the full water rates for it whatever help in the way of rain may follow. But in the upper reaches, those who intend growing ordinary grain and fodder crops during the hot weather months, will wait for the rains to begin in the later half of June, or early in July; and if they obtain good rain by then, they commence ploughing and sowing, knowing that if the rains continue normal until well on in September, their crops will be matured and are safe. without any assistance in the way of canal irrigation being required. But if the rains do not commence in good time, as usual, and a drought ensues, they cannot wait very long, or the sowing season will pass away; but by the middle of July must take canal water if they are to grow as good crops, and to as great an extent as they need. Again it sometimes happens that good rains commence early, and the cultivators plough and sow rejoicing; but after a time, the rains fail and a long drought ensues during July and August. The crops begin to droop and dry up; and to save them their owners are forced to have recourse to canal water, for which they are glad and willing enough to pay the water rates, where they are unable to give irrigation from wells by lift.

In the tract of country traversed by each of these two canals, the upper portion was thickly populated and largely cultivated before the construction of the canal; the middle portion was moderately populated and cultivated, with much waste land interspersed; while the lower portion was mostly uncultivated waste land with a very sparse population. When the canal was completed, and irrigation commenced, the existing population could easily obtain all the water it needed, and irrigation in the upper reaches was freely allowed, or even encouraged, in order to dispose of the water available. But by degrees cultivation increased in the middle and lower reaches, by the existing population gradually increasing and extending the area it could manage to plough and sow; and by the advent of newcomers who bought land, or were given grants of land by the government as rewards for past good service. The government has, by this means, been able to pension and reward, at a small cost to itself, great numbers of soldiers and civilians, who thus have become useful and profitable members of society instead of being non-productive on money pensions alone. With the demand for canal water thus largely increased in the middle and lower reaches, the supply available in the rivers for both these canals during the cold weather is very much be-

low the demand; and it has become necessary to refuse irrigation largely during the cold weather in the upper reaches. This is not such a great hardship to the people as it might at first sight appear; for in consequence of the canals having been in flow, and irrigation practiced for so many years, the subsoil water spring level has risen considerably, and is near the ground surface. Irrigation from wells is therefore easy and profitable; there are many wells in this tract of country which have fallen into disuse, since canal water was obtainable, and these can be readily brought into use again, while new ones can also be constructed at a small cost. Again the cessation of irrigation for half the year will check the too rapid rise of the spring level toward the ground surface, while the general use of lift irrigation from wells will even lower the spring level again to some extent; so that the soil will be saved from becoming saturated, and be kept wholesome, fit for use, and inhabitable.

The tract of country, to irrigate which the Chanab Canal was constructed, was almost entirely barren waste and uninhabited jungle; this jungle consisting of certain plants, shrubs and low trees, which grow with very little rain to nourish them. It had not been claimed by anyone at the time of the settlement of the Panjab after annexation, and therefore all the proprietary rights to it fell to the government. The rainfall is too scanty and uncertain to allow of cultivation and the only inhabitants were owners of herds of camels, cattle and flocks of sheep and goats, which managed to find a sustenance on the grasses that grew after rain, and on the jungle growth. Camels and goats can subsist entirely on the leaves of shrubs and trees. The subsoil water was at far too great a depth below the ground surface to allow of irrigation by lift from wells. Hence the land was new land, virgin soil, uncultivated for centuries; and before the advent of canal water, was practically valueless. But directly irrigation was practicable, by canal water being made available, its value at once rose to about $15 per acre, in the open market.

There being little or no population on the land to utilize the canal water, government had. concurrently with the construction of the canal. to colonize and to bring settlers on to the land; so that as soon as the canal should be open for irrigation there might be irrigators to make use of the water. Accordingly settlers were invited to come from other districts, which. having been inhabited and cultivated fully for generations, had been congested and needed an outlet for their surplus population.

There was no difficulty in obtaining new colonists; they came freely; the colonization officer, specially appointed to allot land to them, had rather to exercise discrimination, and select the most suit-

able; those acquainted with agriculture, and ready to work themselves as farmers, being taken on at once.

This system of constructing a new canal in waste land, and colonizing the land by new settlers has already been tried on a smaller scale, and had answered very successfully in the Panjab, in two other places where inundation canals were constructed. The people having seen or heard of these, were quite willing to come where there was a perennial canal, and felt assured that their future prospects as colonist would be quite safe. When the construction of these two canals was determined on, it was quite a new experiment in colonization in North India and no certainty was felt that sufficient colonists of the right stamp could be induced to come without great attractions, and valuable considerations being held out. Among the conditions therefore, put forward, was the promise, that every colonist would be allowed to purchase outright the full proprietary rights in his land for a very low value, about $2.00 per acre, if he should prove himself able within a few years, to bring it all under cultivation. It was not long however, before the government found that in so doing it was virtually giving away for next to nothing much valuable property. The land became worth several times that value, and purchasers were willing to pay the full value. The government therefore, naturally, reasonably and wisely determined in future cases to retain the proprietary rights in its own hands, or to sell land only at its full value as land with assured irrigation rights and facilities.

There were other strong reasons why the government should keep the ownership of the land in its own hands rather than sell it. When any lots of land were sold or leased to men who were not themselves real colonists, wishing to settle on and farm the land, such men brought in tenants from outside and rented the land to these to cultivate. Now the prospects of tenants on this rich virgin soil, with an abundant and assured supply of water for flow or gravity irrigation were far better and safer than those of tenants in neighboring places, where cultivation had to be carried on chiefly by lifting water from wells by bullock power; or where there was a less certain means of irrigation from the old inundation canals to obtain which irrigation also much time and labor had to be spent on annual silt clearances in the canals and distributaries. Consequently these places were largely deserted by their tenants for the new colony lands; and the owners of the former loudly complained of being ruined by their tenants being attracted elsewhere, and their land being thus abandoned and thrown out of cultivation. Government also lost the land revenue assessed on these lands as cultivated land. It became therefore necessary to see that the colonization of new land did not tend to throw other land out of cultivation. If the new land was sold or leased to capitalists,

or owners of land elsewhere, such had as a rule, no scruples or conscience whatever as regards attracting tenants from other estates which needed them, but would unhesitatingly take any they could get, regardless of their thus ruining other landowners With them it was naturally as might be expected a case of every one for himself; but governmeat, as the custodian of the interests and well being of all, as well as of its revenues, as naturally found it necessary to take precautions when allotting land, and to make sure that its new colonists and tenants were really obtained from the congested districts from which emigration was desirable. The civil colonzation officers, therefore had plenty to do; while the engineers were at work constructing the canal, with its branches, distributaries, village watercourses, and all the numerous works on these, he was at work investigating the means and circumstances of applicants for land, and allotting to each only as much as he was likely to be able to make full use of.

When the Chanab Canal was ready for opening, government offered for sale by auction, a good many thousand acres of land, in estates of varying size. There was good competition for these among the leading capitalists and large landowners of the Panjab, and the average price per acre realized was about $15. Though government intended to keep the ownership of most of the land in its hands, yet it sold these estates, situated in different parts of the tract of country to be irrigated, under the impression that wealthy and influential purchasers would make trustworthy and good landlords, would improve their land to the best advantage, would treat their tenants well, and altogether would be model landlords, and that their estates would be model ones and patterns for all the smaller owners and tenants to form their own by; that the great mass of the colonists would be benefitted by having a good and well cared for estate near them to imitate; and that these model landlords would be leading and representative men for the whole Canal Colony. But the result proved far otherwise than was expected. These landlords, as a rule, cared little or nothing for the display of any public spirit, or disinterestedness, but cared much for getting quickly all the profit they could. Their estates were rack rented, crops were grown as fast as possible, with the result of speedily impoverishing the soil; and very soon instead of being models of how to do it, they became rather object lessons or how not to do it. The landlords preferred, as might be expected, to live on their old established estates, or in their city homes, where they had every comfort and convenience about them, rather than set up a new residence in a fresh country, where they could not readily obtain many of the luxuries they were accustomed to, and would have to live among strangers. The government therefore pre-

ferred to be itself the model landlord, and give its tenants valuable occupancy rights on their estates at a fair rent if they proved themselves good tenants.

(Continued next month.)

THE ISLE OF MEMORY.

By J. A. Edgerton.

From out the overarch of gray
I see a golden clime;
And there the silver ripples play,
And there the blue waves chime;
Where you and I together,
In sweet and stormy weather,
Floated for a little way
Adown the Stream of Time.

There is a glory lost to view,
A loveliness withdrawn;
The skies have never seemed so blue,
So beauteous the dawn,
As in the happy old time,
As in the glad and gold time,
When life was new and hearts were true—
The days that now are gone.

Since you have gone away, my sweet,
The world has been so gray;
My life has never seemed complete,
As in that early day.
There is a measure scant, dear,
From the soul's hidden want, dear
A yearning nothing else will meet,
Since you have gone away.

I've sought to find in other eyes
A surcease for my pain—
In other scenes and other skies,
But I have sought in vain;
For whatso'er I do, love,
My heart returns to you, love.
The sad and sweet old memories
Come back to me again.

The years have been so long, dear heart,
I thought I might forget;
But the night silences impart
To me the old regret.
Old dreams come o'er me thronging,
The old and nameless longing.
The spirits of the dead past start
To life around me yet.

VALUE OF IRRIGATED LAND.

PROF. ELWOOD MEAD TESTIFIES ABOUT IT BEFORE THE UNITED STATES INDUSTRIAL COMMISSION.

The following is the testimony of Prof. Elwood Mead, irrigation expert of the Department of Agriculture, before the United States Industrial commission, as to the value of irrigated land.

"The value of irrigated land is governed by nearness to markets, by the climate which governs the kinds of production, and the distance and cost of railway transportation to the great markets of the world. In southern California and around Phoenix, Ariz., where you can raise citrus fruits and other high priced products, irrigated land reaches a value as great as is found anywhere in this country, or perhaps in the world; there lands having no improvements except the orange orchards, have sold as high as $1800 an acre and perhaps higher—but I have seen lands that sold for that price in southern California—and water has a corresponding value. Water rentals reach to figures that would be impossible elsewhere in those sections. I know of instances where water rents for $45 an inch a year, and where the rights to it reach as high as $1000 an inch. Now, when you come to the northern part of that arid region, the portion that competes with the agricultural districts east of the Rocky mountains, there you get into cheaper water supplies and cheaper lands.

"Throughout the greater part of the arid region it will always be largely devoted to the growing of live stock and to gardens to supply the mines and the manufacturing and commercial centers of the region. After you have satisfied your local market then you have not anything but the furnishing of the winter supply for live stock as a basis for any large development. The greatest industry throughout the greater part of the arid region is live stock, and that today is largely based on the use of the remaining public lands and the private lands that have passed out of the hands of the government or the railroads as a grazing ground. Formerly it was the practice to turn cattle and sheep loose on those grazing lands and let them go from youth to old age without ever having any care or shelter—simply turning them loose winter and summer. They earn their subsistence off the open range. But that is now giving away to the practice of feeding in winter. That is not voluntary; it has been forced.

"The over-pastuting of the public and private grazing lands has made it impossible to depend on them for the winter's food supply;

and you have to provide for it; and therefore you have to depend on the irrigated lands, and those lands to be available have to be distributed throughout the range country because when the storms come in the winter you cannot supply stock 50 or 100 miles from a railroad, even if you had an unlimited supply of feed at the railroad. It is impossible to transport it; you must store it where it is needed, and the needs of the livestock business have been one of the greatest incentives to irrigation and furnish one of the best markets for crops grown, principally native hay and alfafa. Those are the two leading general crops. I do not think corn can ever become a general crop under irrition. It is grown in restricted areas as a part of the system of rotation, in places as a cultivated crop; but there is a considerable portion of the arid land where it is too cold nights. That is a characteristic of the arid region that it is too cold nights to make it a corn-growing region. Besides, alfafa is a better stock food, and you could not grow corn at a profit if you had to ship it out.

"Now the same thing is true of wheat. Unless there shall be a market in the East so that you can get it to the ocean without excessive railroad charges, there will never be any large development of the wheat growing industry in the irrigated regions. You cannot grow it and ship it out. The great bulk of the wheat grown now is consumed at home, and in a good many of the arid states they do not raise enough to supply their home demand, do not begin to raise enough. Montana, Wyoming and Idaho are all importers of flour. They are considerable importers of oats. They have not reached the point where they supply the home demands, and this is true of nearly all those states, that the development of mining the precious and useful metals and the growth of the home demand for the local food supply is going on now faster than the extension of irrigation. Furthermore when we have done all we can, there will not be 10 per cent of the territory west of the 100th meridian, until you get over into the rainy districts on the Pacific coast, that can ever be brought under cultivation. Either there is not the water or it is not available; you cannot make use of only a small fraction of the Columbia. It is questionable whether we can ever utilize all of the Colorado, and it is doubtful if we can make a complete utilization of the Missouri.

"The system that ought to be adopted is to attach, if possible, the grazing to the irrigated lands; give a man who has 160 acres of irrigated land a preference, a perfect right to lease a certain area—and not a very large area—of the contiguous pasturage so as to have the pasture lands divided up as irrigable lands are into small holdings. I would not permit anybody to lease more than four sections. Now, that is not a popular doctrine in the West today. That is not popular with the men who use it because they keep much larger areas. It

would require a readjustment of the range stock business as it exists at the present time. But I do not believe it would greatly promote the creation of homes; it would add immensely to the security and value of the irrigated farms, because you get 50 or 100 miles away from a railroad or very large town, mining towns, and ability to use the range in connection with your irrigated land is just about as necessary as a water supply to make it profitable. You can not grow hay 50 miles from a railroad and haul it to market; it does not pay. As it is now, the men who do that, sell their oats and hay to the range stockman, but it would be a better plan if they could each one of them have a little interest in the grazing lands for their own stock and feed their own products to their own stock.

"To show how legislation without any expenditure of funds can promote both the development of a country and its propensity after it is settled, we have an illustration of that in what is known as the Carey land law. The Carey act gave to each state the right to control one million acres of land if they would accept the conditions of the grant; and five states accepted it. The reason for this was to overcome a difficulty in the existing land laws. You can take a country like along these canals there that is subject to the operation of the public land laws, and you began to survey a ditch, and before the survey ended there was a filing on that land. The minute that you begin to set your stakes out there it becomes manifest that a large portion of public land is going to have a canal, that there is going to be an expenditure of several hundred thousand dollars to build that canal, and the expenditure of that money adds to the value of every acre of that land. The very minute that it is seen that it is going to be irrigated under the homestead law, now men will rush in who never have been farmers, who do not expect to be farmers and who simply seek to share in the unearned increment. They file on that land, and when the canal has been completed the land is all filed on, and it is very largely filed on by people who have no other object but to be bought off. They are perfectly willing to sell out for a consideration, or they will hold on in the hope of selling, but the result is that the lands are kept out of the hands of men who would settle on them. It is directly a tax on the man who does come in to occupy them. He has to pay more for them, or the canal company has an enterprise on its hands with no revenue coming from it because the lands are held by noncultivators. Now that is the objection to the homestead law and its operation in the arid region. It does not require, in addition to living, cultivation; if it did, the homestead law would be an ideal law. Now, two of the states, in accepting this grant, framed what I believed to be the true land law of the arid region.

"There is going to come a time, and that time is here now, if development is necessary, when there will have to be an expenditure of public funds in order to secure certain kinds of development. There are rivers like the Missouri that I do not believe it will ever pay within our lifetime to take the water out of those streams because it will cost so much that the land will not pay for it. Irrigated land and the value of irrigation improvements is measured by the value of lands in the Mississippi valley or the value of irrigated lands under cheaper works, and you can go only just so far with private enterprise. Now there are prospects there that have been serving some time that it would pay as a public work perhaps to do it, because in bringing land that is now worthless into a condition of productivity, you create homes, you create taxable values that the public gets the benefit from that the private investor does not share in, and there is the argument in favor of state or national aid to certain classes of important works. And there are certain kinds of works that never will be built by private enterprise until they get that aid. But there are a great many works that, if there would be better laws, would be built by private investors without loss. You would by better legislation very greatly promote development without any appropriations of money.

"The first canals were taken out of the sluggish streams that flow into the Gulf of Mexico; but when the importance of the value of the rice product becomes established, and lands rose in value from $5 to $50 and $100 an acre it became manifest that those streams would not supply the need of water; and they began looking about for other sources of supply. They found one by putting down wells, so that the pumping stations to supply water from the rivers are being supplemented now largely by wells. Hundreds of wells are going down throughout that portion of Louisiana and this year a study is being made to determine the source of that water supply. If it is simply that the subsoil is filled with water and it can be pumped out, it will soon be exhausted; but there is a belief that it is being reinforced from the Mississippi. There was a conjecture at the time I was there, but a study is being made to ascertain if it be true. If it be true, there will be a capacity for indefinite extension by wells of water.

"The success of rice growing there after the long period in which we had been continually shrinking in our rice production, has led to increased interest along the Atlantic seaboard. For years the rice growing there, if not unprofitable, has not been sufficiently profitable since the war to lead to any extension. In fact there was a constant decline. Old canals in use long before the war were going out of operation; but that is now being extended and the question now is whether they can adopt the Louisiana methods.

"Rice cultivation in the Carolinas is largely after the methods

prevailing before the war. The crop is harvested by hand—cut with the sickle and bound by hand. The reason it is so much more successful in Louisiana is the application of modern machinery. The crops there are cut with a self-binder. There have been economics brought into the field labor, and the methods of applying and distributing water are patterned after the West rather than after the Carolinas. There is an economy in the distribution of water, and there is another very marked economy in the harvesting of the crop. An industry that was not before remunerative has been made exceedingly profitable.

"The southern territory is also likely to develop irrigation in the growing of forage crops. Alfalfa grows in the south. It will not grow in the middle east; it freezes out in the winter and does not seem to thrive, but it will grow and live through and become a perennial in Louisiana. There seems to be quite a field for the use of irrigation in the growth of alfalfa and other forage crops in the South wherever you can get water at sufficient cost.

"Now the same questions arise in the East, where development has gone far enough, that have arisen in the West. In the South the question has arisen between the different canals as to who has the better right if they pump out more than they will supply. They will in time have to establish some system of priorities there. They will have to determine how they are going to operate under the doctrine of riparian rights. That is an unsettled question there as yet. On one of the streams last year so much water was pumped out that the river changed its direction and ran up stream for a distance of fifty miles. The current changed and ran back, and salt water came in from the Gulf and ruined the pumps farthest down the stream. Those are matters that will require adjustment. If there should be in the East any considerable demand on the streams, the right to take water from eastern streams will be called in question, so that the economic and legal phases of this question have already ceased to be sectional.

"There is a very large district, reaching from the Gulf of Mexico to the Canadian border, where this question needs to be studied. It embraces western Texas western Kansas, western Nebraska and the western Dakotas. These states were first settled up in the humid part. They were settled up and became states or settlements quite sufficiently important in the western arid or semi-arid part to render irrigation problems important. They are in some respects among the best parts of the arid region, because ditches can be built at small cost. It is a country well adapted to the distribution of water, and it only requires a comparatively small amount of water to supplement the rainfall. As you go farther west, if you have only ten inches of rainfall and an increased evaporation, you must supply more moisture

by irrigation than where you have twenty inches of rainfall and less evaporation; so a given amount of water will irrigate more acres there than farther west.

"In that region we have two questions. In the Dakotas it is very expensive to bring water from the Missouri river, and in Nebraska we have the uncertainty at the present time regarding the state law—as to whether you could proceed under it. Nebraska is comparatively well supplied with water. The North Platte is a stream that cannot be utilized to any great extent in the West. The Loupe is a good stream, and they have in these two rivers an opportunity for a very large development. As you go south of that the difficulty in Kansas is the question as to the extent of the underflow, and whether it is practicable to get some means of pumping it up.

"Again the regulation of streams that rise in a country to the West. When you go south into Texas you have still a different question In southern Texas there is a considerable territory that can be irrigated from springs and wells, and this applies all the way through Arizona and New Mexico.

"A great many streams are torrential in character, carrying an immense flow in character, carrying an immense flow of water and then running down to nothing. You must store these streams in order to make much use of their waters, and the problem of storage is a complicated one. It involves the question of the sediment in these southern streams. the salt. It is an important question to build a reservoir in the channel of a river, and when you have a large investment in houses and people settled there, to have your reservoir fill up and you have to move out. It is simply a waste of money and a waste of energy. That is a question the Department of Agriculture is studying, and arrangments have been made with the Agricultural college of Texas to gather samples from these streams and see what would be the probable result of letting the mud they carry deposit on the soil."

THE NEED OF IRRIGATION.

BY "OLD IRRIGATION," IN THE REFLECTOR, ABILENE, KAN.

Again in the cycle of time, the people of central Kansas find themselves face to face with conditions of aridity, hot winds and crop shortage, that recall vividly the disastrous seasons of 1860, 1874 and subsequent years, and emphasize now as then the necessity of artificial aid in the distribution of moisture, if we would have reliable and satisfactory results from crop returns.

In memory of the unmerciful joshings meted out to the advocates of irrigation in recent seasons of favorable conditions and excessive rainfall that threatened to develop a species of web-footed bipeds we trust that our friends will not be severely critical if we take advantage of the present atmospheric status to score a few innings by way of reprisal and to even things up generally.

The spasmodic, incomplete and unsatisfactory efforts at irrigation during periods of drouth in the last decade and the prompt abandonment of such effort on the first indications of rainfall, is proof conclusive that the people of central Kansas have no relish for a persistent and systematic movement along those lines, such as is practiced in the more arid regions of the west, where irrigation is an absolute necessity and where conditions make it a case of "Root hog or die."

We are forced to the conclusion that our people would rather trust their crops to the lottery of atmospheric change, accept what they can get and be satisfied, or develop into a knocker with this evident reluctance to adopt a system of intense farming. It is manifest that if we are to have increased humidity in central Kansas it must be brought about by some other method than that of individual effort through the medium of pump or diverted stream, presumably by a change and betterment in climatic conditions. Can such a change be accomplished and how? We answer unhesitating, yes, by the conservation of storm waters through a system of artificial lakes, storage reservoirs, catch basins, dams and ponds, as outlined by Elwood Mead, Major Powell, officials of the coast and geodetic survey and other eminent civil engineers, advocates for the reclamation of the arid west.

When the general government shall take the matter of reclamation well in hand (as it will in the near future) complete the system of segregation so auspiciously begun, and construct the necessary reservoirs throughout the vast area bounded by Old Mexico, Oregon and

the sixth principal meridian, it will yield a superficial area of surface water exceeding that of the entire chain of northern lakes combined; with such an expanse of area for evaporation, precipitation and increased rainfall is inevitable.

It is computed that in this vast territory there are more than 100,000,000 acres of barren arid land that can be transformed into ideal farms and ideal homes for more than 50,000,000 people. Public sentiment is rapidly crystalizing into the belief that it is wise statesmanship for the entire nation, and the duty of the general government to reclaim this arid land as rapidly as possible. And now that we have a senator who has the ability to present and the nerve to demand of congress a recognition of western rights; a senator who will stand shoulder to shoulder, "cheek by jowl" with the Carters of the U. S. senate, to arrest and divert to a better use the extravagant and wasteful appropriations for the protection of the lower Mississippi plantations under the guise of "river and harbor improvements," we may hope for a speedy fruition of this wisely conceived design for development. " 'Tis a consummation devoutly to be wished."

While we sincerely believe that it is possible under the reclamation to increase the guage of rainfall and minimize the hazard of farming in central Kansas, we abate no jot or title of our declaration that it is economy and to the best interest of every farmer to have a plant of sufficient capacity to irrigate his orchard and truck patch, and as much more as possible. Let us irrigate.

THE DIVERSIFIED FARM.

In diversified farming by irrigation lies the salvation of agriculture.

BIG HORSE CONTRACT.

One of the busiest places in all Texas at this time is Polk Bros.' stockyards at Forth Worth, where the British government is receiving the purchases of horses and mules made for the army in Africa. The present contract is for 2,100 head of horses, and on Saturday last over 900 of this number had either been accepted and shipped, or were in the pens waiting inspection. The agents of the British government are at present inspecting and receiving 300 animals a week, the amount paid out being from $12,500 to $14,000 on each of the two pay days. This money finds its way to a number of counties in Texas, and some of it goes to people outside of the state. At the present rate of progress, it will take four or five weeks to complete the contract.

The Polk yards now have quarantine pens, and all arrangements have been completed for handling cattle north of the line. All the Jersey cattle, save one have been sold, and the lone Jersey has been put in a stall so that no possible contact with cattle coming in can occur. It is understood that the inspectors who have been operating at the Union stockyards will also look after the Polk yards.

Arrangements have been made at the yards for a sale pavilion, and the intention is to have thoroughbred cattle, horses and mules sold there at specified times, but for the present Mr. Polk and all hands are kept busy looking after the horses for King Edward VII.

FARMING CHEAPENED

Between 1855 and 1894 the improvement in agricultural implements and machinery was such that the time of human labor required to produce a bushel of corn on the average declined from 35¾ cents to 10¼ cents. The greatest advance was made in the shelling of the corn, formerly done by hand. In this case the machine operated by steam shelled a bushel of corn a minute, while in the old way the labor of one man was required for 100 minutes to do the same work. The amount of human labor now required to produce a bushel of wheat from beginning to end is only ten minutes, while in 1830 the time was three hours and three minutes. During the interval the cost of labor required to produce those results declined from 17¾ cents to 3⅓ cents.

In 1830 a heavy, clumsy plough was used, the seed was sown by hand, and was harrowed into the ground by drawing bushes over it; the grain was cut with sickles, hauled to a barn, and threshed with flails; the winnowing was done with a sheet attached to rods, on which the grain was placed with a shovel, and then tossed up and down by two men until the wind had blown out the chaff In the year 1894 the ground was ploughed and pulverized by a disk plough, the seed was sown with a mechanical seeder drawn by horses, the reaping, threshing and sacking of the wheat was done by a combined reaper and thresher drawn by horses, and then the wheat was ready to haul to the grainary.

In the case of the corn crop the money measure of the saving of human labor required to produce it in 1899 as compared with its production in the old-time manner was $523,276,642; wheat, $79,194,767;

oats, $52,866,200; rye, $1,408,950; barley, $7,323,480; white potatoes, $7,356,820; hay, $10,034,868. Total, $681 471,827. And yet the improved machines by which this has been accomplished have come into use only to a limited extent. They are mainly adapted only to use in farming on a large scale under the most favorable circumstances.

Comparing retail prices—the prices paid by the farmers for machines and implements—it is shown from tables of comparison that in the case of one manufacture, surreys selling for $225 in 1880 sold for $85 in 1900; top buggies with a price of $90 in 1860 and $60 in 1880, sold for $43 in 1900. The corn drills of 1880 sold for $12; those of 1890 for $8. Harrows declined from $15 in 1880 to $10 in 1890; plain float spring-tooth harrows from $20 to $10; disk harrows from $27 to $18. Six-foot twine binder harvesters were sold in 1880 for $325 and in 1890 for $120, and the "combined" harvester was sold for $150 in 1880 as against $65 in 1900. The price of mowers in one establishment declined from $100 in 1860 to $40 in 1900; in another from $160 to $40, and in still another from $120 to $45. — *Leslie's Weekly.*

RICE CULTURE AND PROFITS.

Oswald Wilson, special field agent of the division of statistics, department of agriculture, read the following paper on "Rice Culture and Profits" before the Cotton Growers' Association at the Farmers' Congress.

Rice is the greatest cereal product in the world, considered from a commercial standpoint, and as an article of food.

We can only realize its magnitude and importance when considered in comparison with other cereals. Wheat is a great cereal and the so-called staff of life. It has a wide range of production, being grown in nearly every country on the globe. The total production of wheat in the world for 1899 reached the stupendu ous amount of $2,723,407,000 bushels, which would make 6,500,000 carloads, with a market value of $1,399,100,000. But this does not come up to rice.

Corn is a great crop and in 1899 the world produced 2,634,109,000 bushels, valued at $833,400,00.

These are two great staple cereals, but their combined production will not come up to rice. We must find another.

Take oats. The world's production in 1899 reached 3,212,689,000 bushels. This immense pile of oats had a market value of $708,170,000.

Here we have the three great staple grain crops of the world, with an aggregate production of over eight and a half billions of bushels and a market value of nearly $2,940,670,000. But this does not equal rice.

Just a moment think of the immense number of people engaged in the production of all the wheat, corn and oats in the world, time employed, acres of land tilled and machinery used. Add to this the people employed in marketing the grain, on railroads, in mills, and laborers to handle it, and we have a greater army than the combined soldiers of the world.

Rice, with its 74,074,369,193 pounds, valued at $2,962,974,781 is greater by more than $20,000,000. Again, rice is the principal article of diet of 800,000,000 people, or more than 54 per cent of the entire population of the world, while the other cereals combined only supply 46 per cent. Which is the greater cereal?

Coming nearer home, we find that rice has been produced in the United States for nearly three centuries, but only of late years has it reached much development.

During the past ten years 20,000 persons from the north and west have been attracted by the demonstration of the fact that irrigation in conjunction with methods successfully applied years ago in wheat growing in the prairie states, would

make rice-growing equally successful. The result is the existence of a practically new industry in Louisiana and Texas, with a capital of $5,000,000 invested in 100 canals, 1500 miles in extent, and now capable, under present water conditions, of flooding 900,000 acres, and increasing each year.

After securing a location possessing the soil and economical lay of the land requisite to an economical irrigation, it will require approximately $10 per acre to equip an irrigating plant and prepare the fields for seeding. As local conditions and requirements differ, an accurate estimate cannot be given that will govern all localities, but the prospective farmer can figure on this amount.

The cost of producing a crop of rice is approximately the same as a crop of wheat with the cost of irrigation added, which is one-fifth of the crop. This is the price charged by canal companies for the use of water.

The average value per acre of rice is $30, less the water rental of $6, leaving $24 to the grower.

A moment's comparison with the great cereal crop of the United States will show how fortunate the rice grower is. The average value per acre in 1900 was: Corn $9.02, wheat $7.61, oats $7.63. Then an acre of rice paid the farmer as much as three acres over each of corn, wheat and oats.

Next to the production, milling the rice is very profitable, and is a subject of sufficient importance for an extended discussion.

Leaving out the value of the plant, the capital invested and operating expenses, we can give the gross profits of milling.

In milling 100,000 bags of rice of an average weight of 183 pounds, for which the farmer received $3.35 per barrel, making a total of $325,000; would give, merchantable rice 10,273,000 pounds, valued at $3 35 per 100 pounds, $395,520; brewers' rice, 875,000 pounds, $15.400; polish, $5,300; bran $90.22; gross value of milled product $425,242; gross profit $90.242.

To those interested it will be easy to ascertain the net profits in milling.

Rice is the most profitible commodity handled by the railroads. It pays about four times as much as cotton in revenue. The most vital question to the human race is that of food. Next to having food is that of its cost. The cost of food applies not alone in dollars and cents. In other words, it is of the highest importance that we obtain the greatest amount of the life-sustaining energy from our food with the least tax upon our systems.

There is no one article that will supply all the demands of our body. There is no complete food in any one article. We require a variety. At the same time the laws of life demand this variety at the least expense of vital energy and in this rice excels all other articles of food. It contains more nutriment than beefsteak and potatoes with a less tax on the human system for digestion. Its commercial price places it in the reach of any one. It is no new food. The very fact that 56 per cent of the population of the globe use it make its reputation secure.

We believe that the production of rice in the United States is in its infancy. With the exception of Mexico, our crop is a mere bagatelle of the world's production.

We believe that rice will be grown all over the southern states wherever man can control irrigation.

We have the soil, the climate and, better than any Oriental country, we have American skill and labor. Today the rice farmer of Louisiana and Texas is cultivating 100 acres to the Oriental's one acre

Will there be overproduction? We think not. The Oriental countries show but a slight increase in the past five years, not as great as the population has grown.

Again, we are opening up an immense territory of rice eaters in our island pos-

sessions. The United States will become a great consumer of rice.

FRUITS ON THE FARM.

Following is a paper by E. W. Kirkpatrick, of McKinney, read before the Cotton Growers' Association at the Texas Farmers' Congress:

No farm is complete until it is well supplied with all fruit growing trees and plants that are adapted to its soil.

The occupants of a farm cannot enjoy, in all its completeness, the pleasures of home life without fruits. Every soil adapted to the growth of grain or grass will produce fruit. No class of productions require less care than fruits, and none give better returns in wealth, happiness and good cheer.

The orchard and the vineyard are more than the art and poetry of the farm; they give rich returns in substantial wealth and add attractions which lend additional market value.

The ease with which rare seeds and plants can be grown in waste places along the fences, the roads, the streams, barns and pastures and the immense beauty and value they would add to every farm should induce every farmer to plant most liberal quantities.

In addition to the material or money values attaching to "fruits of the farm," many other charming qualities exist in the aesthetic, moral and sentimental sides of the orchard of home. When children have opportunity to follow the growth of trees and plants, and become familiar with the development of bud, flower, and fruit, and enjoy the sweet pleasures of nature's rarest art galleries, music-halls and cafes, they build recollections of their sacred home which anchor them against the temptations so ofttimes fatal to passionate youth.

Who can measure the wealth added to home by a plentiful supply of fruits, flowers and shade, the help and strength lent to a wearied wife and mother by these sojourning angels.

The trees lend their strength and grace to the arms and hearts of boys and touch our girls with dimpled roses. These constant and permanent sentinels guard our servant animals against both frigid blasts of winter and burning heat of summer. They invite the sweetest warblers to sing the song of universal welcome.

When a farmer feels the enchantment of fruits on the farm it leads him on to flowers on the farm and fowls on the farm, and bees and fish and fountains, and walks and lawns, and all these bring joy to the household and honor and fame to the farmer.

Every farmer should plant a few trees of best known varieties, and by having bees to aid in cross-fertilizing the flowers, the seeds will produce many new and valuable varieties for any person who will plant and cultivate them. This is one of the many charming reasons why we should have fruit on the farm.

There are more than ten million acres of fruit lands in Texas which could give a profit of $100 per acre per annum, thus adding a billion dollars to current income each year, and this is another reason why we should have fruit on the farm.

When a man asks one of God's angels to be his wife and neglects to have fruit and flowers at the home, it is cause for action in divorce, and is a warning to those who have no fruit on the farm.

AGRICULTURAL INDEPENDENCE.

Secretary Wilson said to the Washington correspondent of the *New York Sun* a few days ago:

"There is no doubt that this country, within a few months, will be in a position to ignore every other nation on the globe in the matter of food products. We will produce within our own domain everything that goes upon our table and upon our backs. We will then be, commercially

and industrially, almost independent of the other nations of the world. Hence any trade combination which may be effected against us will count for nothing. Whenever we get ready we can come pretty near starving any other nation. Therefore, an effective combination against us will be an impossibility.

"The principal product purchased is sugar, which comprises nearly one-fourth of the total of products imported. The department in the past has been making experiments to ascertain in just what sections of the country sugar can be raised to such an advantage as to obviate the necessity of going to foreign markets to complete our supply. We want to raise beets, as therein lies the principal source of the sugar product. Within the United States there will be over forty beet-sugar factories in operation by next fall. They will be situated in almost every state along the northern border from New York to California. I believe that within a few years we will produce all the sugar we require, and we will then be in a position to ignore the foreign product. Our experiments have shown that the sugar produced from our quality of beet is much richer than that manufactured in foreign countries. Our product, therefore, will be much more desirable. When this result shall be attained the sugar trust will, in my opinion, vanish for the reason that the trust refines imported brown sugar, while all the American factories will finish the product and place it in entire readiness for sale on the markets.

"We are now succeeding admirably in the production of tea in the United States, it is only a question of a short time when we will be able to raise all the tea demanded for use in this country. Our new possessions will aid greatly in the production of some of these tropical products."

The *New York Times* says:

"It was the opinion of George Washington that the farmer who grew what he and his required was the happiest and most independent man on earth. It is good, too, for this nation to be independent of all sources save its own for the actual necessities of its life and activities. Its political independence is helped and assured by the possession of lands so distributed among the climates that ships may find in it own ports the various cargoes that supply its wants."

PULSE OF IRRIGATION.

IRRIGATING SMALL TRACTS.

In several valleys of Montana the owners of small tracts of land are putting in windmills and small gasoline engines. This is noticeable in the Jefferson valley. At Whitehall several residents of the town are driving wells and erecting windmills, and one citizen has installed a small gasoline engine for pumping water on his lawn. With the increase of the cultivated area and the settlement of the state the era of wells and pumping devices for irrigation purposes will increase. For a small tract the windmill has been found satisfactory and during the next twelve months it is a safe prediction that 500 to 750 windmills will be installed in Montana towns and on farms.

On the larger places where it is necessary to lift more water than the capacity of a windmill, gasoline engines will be installed, and in that way water will be assured.

In many places where running water is not available for all, good wells abound and abundant water can be had with no greater lift than 20 to 30 feet.—*Montana Stockman and Farmer.*

WINTER IRRIGATION.

Prof. A. J. McClatchie, who is so well and favorably remembered by the fruit and dairy men of Southern California, has just issued a very valuable bulletin regarding winter irrigation. This gives the result of very important experiments performed by Prof. McClatchie. He finds that deciduous trees, especially the peach, which were very thoroughly irrigated in winter, grew better and gave more fruit than those not irrigated but which received the usual summer irrigation. This was in the Salt River valley, where they have almost no rains. Often water can be had cheaply and in abundance in winter whereas it is scarce and expensive in summer. This makes these experiments very suggestive and may well lead to individual experimentation on the part of the most of our deciduous orchardists. We know that in seasons of copious rainfalls our deciduous trees often do well with no summer irrigation. Why, then, should we not fairly soak the ground in winters of light rainfall, if water can be had at little or no expense? This is certainly a matter of no slight importance. I would advise all interested to send for the bulletin. Address Experiment Station, Tuscon, Arizona.—*Col. Cultivator.*

WATER AND CANE IRRIGATION IN QUEENSLAND.

The following important letter from Dr. Maxwell on the subterranean water supply of the Bundaberg district is furnished by the Department of Agriculture:

Bundaberg, March 5th, 1901.

Sir—I have the honor to make a further brief notice of the water and irrigation questions, of which I have spoken on certain previous occasions. At this time some remarks will be confined to investigations that have been made during the past two months at the Woongara division of the district of Bundaberg. As stated by me some three months ago, the indications were that underground water should be found beneath the coastal lands, and near the sea, at very shallow depths.

The location where the present investigations are being pursued is upon the

Qunaba estate, owned by the Queensland National Bank. With others, this location offered good conditions for putting the matter of underground water to the test. Moreover, one of the many small shallow wells found in the district was already on the place, having been sunk by the previous owner, Mr. Barton. This old well, by use of a steam pump, was yielding some 4,000 gallons of water per hour. Upon deepening the source by means of larger bores. the output was increased to 33,000 gallons per hour. It was found advisable (for reasons to be explained at a later time when reporting more fully upon the question) to sink a new shaft, and to drive bores of larger dimensions down to the water-bearing stratum. This new shaft, located about 100 yards from the smaller old one, has been a great success in itself; while also indicating the area of distribution of the water-carrying stratum. When the clayey stratum was pierced by the bores, which entered the gravel water stratum, the water rushed up with astounding force, rising some 14 feet above its confined level. A pump was put down and worked by a Fowler ploughing engine, and at the same time the pump in the older well was kept running at its maximum duty. The united services of the two pumps gave a total of 70,000 gallons per hour, or an output of 1,680,000 gallons per twenty-four hours, and without any effect upon the supply or upon the quality, which was carefully controlled by the laboratory.

It may thus be said that the question of underground water has been settled by systematic tests. The depth at which the water is, and will be, found is determined by the depths of the strata or deposits overlying the water-bearing stratum, which are various. In the present example, the water is found, and rises to within 28 feet of the land surface. Concerning the supply, the indications appear ample for a volume covering the needs for irrigation of the Qunaba estate. The indications, however, are of such a nature as to give promise of a supply for much more extended uses in the Woongarra district.

The cost of the investigations, so far, is very small, being only one tenth of the amount set apart for the purpose by the owners of the estate. This is a most material point. It is due, however, in large part, to the interest and careful working of the estate manager, Mr. J. Cran, and to his capable engineer.

Acknowledgement is due to the owners of the Quanaba estate for providing the facilities and funds for these tests to be made, the result of which may be very far-reaching in the Bundaberg and other districts. We are also specially indebted to the manager of the Queensland National Bank's concerns, at Bundaberg (Mr. Eastick), for having the tests pushed so rapidly; as it was expressly important that the whole matter should be settled if possible before any great and continuous fall of rain. As it is, the results have been attained after a period of drought almost hitherto unknown.

The results of irrigation of cane so far conducted by Messrs. Gibson and Howes, at Bingera, have led them to determine upon a vastly greater scale of irrigation, and an order has been placed by them for a pump to lift 10,000,000 gallons of water for daily distribution. Such courage and enterprise are very invigorating, and of great good to the country.

I hope to be able to speak later of irrigation possibilities in certain localities of the Isis. Very different modes will have to be followed in the several districts with their dissimilar conditions.

At Bingera, the water is lifted directly from the river; in the Woongara it must be raised from underground; while in the Isis the impounding of storm water appears to offer the surest and cheapest source of supply.—I have, etc., Walter Maxwell, Director Sugar Experiment Station.—*Queenslander.*

THE DAY WE IRRIGATE AND WHAT IT HAS BROUGHT TO THE AMERICAN PEOPLE.

About 126 years ago the people of this country numbered only a few millions and were colonists of Great Britain. Today we are fast nearing the hundred million mark and are the proud and happy subjects of the Standard Oil company and the Sugar Trust. To say that our progress in many ways has been phenomenal is stating the case tamely indeed. There is no parallel in history for what we have done and are doing. The nearest thing to a parallel I can think of at the moment was the matter of the Romans who, having conquered the world, gave the wealth of the empire to Nero to enable him to get on an extended imperial whiz—which he did. With "life, liberty and the pursuit of the Filipinos" as our motto there is no telling what we will do in another hundred years Just as apt as not in 2001 we will have swallowed up China and have the laundry business and wooden idol industry of the world well in hand, or China will have swallowed us and some pig-tailed emperor will have built a lot of speckled awnings around the Washington monument to make an ornamental pagoda and be using the capitol building as a joss house. Of course there is no immediate danger of this, but it might happen. Civilizations are peculiar. They go up hill slowly in an ox-eart, but go down on a toboggan "ker-zip" and stick half up in the mud. Had some one told Augustus Caesar that some day a hirsute barbarian would ride victorious into Imperial Rome, fodder his horses in the temples of the gods and chop up the statuary with a meat axe, the prophesy would have appeared very funny to him. His successors, however, failed to see the fun. The barbarian got between them and the joke. The way the American people have been whizzing along and getting their wealth all up in a wad in New York has probably made the shade of the Caesars smile to think how easily a great leader with a million men might hog the whole thing. But let that go. We are talking now of our national growth. We have during the past hundred years done what all the world in all the known past had never dreamed of. We have yoked up the two mysterious elemental giants, steam and electricity, and swept across the world in a chariot of glittering progress. We have learned how to build railroads, and water stocks, and capitalize wind and syndicate a hole in the ground; We have harnessed Niagara, civilized the Indians (that is the dead ones), whipped Mexico, admitted Texas, organized Tammany hall and reduced politics to one narrow channel with a barrel at one end and a blow-hard at the other. We have had a war of our own, have licked Spain with one hand tied behind us, have subdued Guam island and planted our imperial eagles on the adobe palace of Honolulu. We have struck oil in every newspaper in the United States, found gold in California, demonetized silver in Colorado and produced the populist party and the Omaha platform. We have learned to play baseball and football and faro and craps and progressive euchre, and to gamble in stocks and make oleomargarine and moonshine whisky and to dodge taxes and carry sixshooters and to wear bicycle suits and bright red belly-bands; and in many ways have we accumulated the ornamental regalia of a higher civilization. We have elevated the stage from Shakespearian coarseness to refined vaudeville and midway productions of current theatricals; have banished polygamy from Utah and paesented Porto Rico with a beautiful new tariff, having many frills and ruffles and warranted not to rip, ravel or tear. We have produced more colonels, published more books and printed more newspapers than any country in the world. We can pour a great man's speech into a funnel and grind it out of a brass horn

hundreds of years afterward. We can telegraph a criminal's picture thousands of miles so distinctly that the police officials can tell what kind of hair oil he uses. We have annihilated time and distance, made billionaires, built vast cities, fertilized deserts, subdued forests, fenced the plains and have made the buffalo, the wild Indian and the naked truth hard to find. We have learned how to make butter out of beef suet, olive oil out of cotton seed, silk out of cotton, fur out of sheep's wool and social and political leaders out of men who get rich—in any way, just so they get rich and don't get caught.—*Austin, Tex., Semi-Weekly Statesman.*

HAIN'T NO BETTER THAN A FELLER ORT TEW BE.

When I hear a feller talking, as I hearn the other day,
Finding fault about the Bible in a mighty pompous way,
Tellin' all about the burdens his religion used to be,
Then I wonder war he better than a feller ort tew be?

Tellin' how he went a tremblin' and a fearin' all the way,
Tellin' fear uf fire an' torment was the reason made 'im pray,
When he didn't love his Maker, and he loved his sin, ye see;
Then for sure he warn't no better than a feller ort to be.

Ef he didn't love his Maker and he loved hisself the most,
Shure he hadn't no religion to begin with fer to boast,
For he made hisself his idol—like the hethen—do you see?
An' we know sich hain't no better than a fellor ought to be.

Ef he hadn't in his bein' any revrence for the One
Who can care for all creation, from a microbe to a sun,
Ef he didn't mind a takin' that great name in vain, ye see,
Sich a feller warn't no better than a feller ort tew be.

—L. C. H.

ODDS AND ENDS.

DOOM OF THE GREATEST GAMBLING CITY ON EARTH.

Shrewd and thrifty and sporty King Leopold of Belgium has seen somewhat the same sort of handwriting on the wall that Belshazzar saw. He personally may not have been weighed in the balance and found wanting, but the great gambling tables in Belgium have been, and a fraction of every franc bet thereon—in Ostend at least—ultimately found its roundabout way into the King's deep pockets.

Belgium has come to the conclusion, after long and rather bitter experience, that gamling tables pay no one except the proprietor. Hence, the passage of a stringent law that is of more public interest than has generally been supposed, for it means that the greatest gambling hell of our generation has come to the end of its rope, and that one of the most prosperous cities in Europe is in danger of collapse.

One usually thinks first of Monte Carlo in connection with continental gambling, but as a matter of fact the beautiful Riviera resort has been, for the last few years, only an amateur beside Ostend and Spa. It was mostly a show place where the passing tourist risked from five to a hundred dollars for the fun of the thing, or where an occasional millionaire dropped a few thousand dollars and forgot to mention it, or won an equal sum and was heralded as the man who never could lose.

Ostend was different. The gamblers made more of a business of it there, and last season the total sums changing hands over the green cloth at Ostend and Spa were perhaps double the amounts distributed by the Monte Carlo croupiers. Likewise the average amount of the bets at Ostend has far exceeded the Monte Carlo average.

In the last season, only three months long, the tables at Ostend alone made a net profit of $1,400,000, after turning over to the municipality a third of a million in taxes. On top of that each club found it profitable to pay out of its own pocket $16 of each initiate's fee of $20. Ostend was the real gambling center of the world.

The story of gambling in Ostend is significant, and every American municipality could study it to its own benefit. A few years ago any one could leave London at night and be busy losing his sovereigns the next morning on almost any corner of Ostend, at any kind of a game of chance, without the slightest let or hindrance. Ostend and Spa did not object to that at all, but when the rich men's sons at home began to squander their patrimony at the local tables, when Belgium society women lost their own and their children's fortunes, when suicides and forgeries growing out of losses at gaming became startlingly frequent, parliament rose in its virtue and passed a law closing all the small dens, and permitting only strangers to lose their money in the big clubs.

Thereafter, no resident of Ostend might gamble in any Ostend clubs. He had to go to Spa or Namur for his sport and be enrolled as a stranger. Any visitor to Ostend who wanted to try his luck had to go through the formality of joining a club. If, however, he happened to be a guest at one of the leading hotels controlled by the "Compagnie des Grands Hotels," in which King Leopold is heavily interested, his application could be rushed through in a night, and could be seated at rouge et noir

without loss of time, at a luxurious "private" club under the watchful eye of the police, and the parental care of the government inspectors. If he lost his fortune and wanted to take his own life, the matter could be arranged without making undue noise.

Tens of thousands of dollars changed hands every hour in the season, and Ostend and Spa and the lesser Belgium towns to which the same privileges were extended flourished and waxed fat. The losses of the gamesters made Ostend in particular one of the most progressive of cities outside of Buddapest. King Leopold's hotels were crowded, and famous men and gorgeously appareled women—countessess, demi-mondaines and nouveaux riches alike—stood in line waiting for seats at the gaming clubs. The luxury and extravagance of Ostend last season outstripped that of any city of its size in the world.

But in the shadows behind all this feverish gayety and reckless display the records of crime and despair grew larger and blacker until public opinion became aroused despite the wealth that the foreigners were losing and that Belgium was winning. Ostend, Spa, Dinant, Chimay, Namur and the other towns that had rushed in to get some of the plunder stood aghast when a bill was brought into the legislature a few weeks ago suppressing all gambling. With some modifications it was passed, in spite of the fierce opposition and powerful lobbies of the interested parties.

As the law now stands, all games of chance in public places for stakes are forbidden, except when the stakes do not exceed the value of the refreshments taken by the players. Social and private clubs are not considered as public places, and their legitimate members may gamble as much as they like, but the stranger who tries to get a temporary membership for he purpose of gambling will hereafter find himself confronted by dues and initiation fees that will keep him out.

While the bill was up for consideration Ostend wept and wailed that she would be ruined, and that heavy government interests would go down with her in the general smash. The doleful statement was not seriously denied, either. Yet the amendment to exclude Ostend and Spa from the general provisions of the bill was defeated by a vote of 97 to 16, although it is generally understood that King Leopold supported the amendment with all the power he could muster. Now these cities are trying to get the disaster postponed for five years. Ostend has a magnificent beach, and its Casino or Kursal has many attractions aside from gaming tables. It is the favorite resort of the gay old King, and its hotels are some of the best in Europe. But its natural attractions are not equal to those of Blankenburgh, its rival and neighbor, or to those of Spa, the oldest watering place in Europe, with a record running back into the thirteen hundreds. Without the gaming tables to give it life next summer the chances are it will plunge abruptly from the top wave of prosperity to the depths of ruin, unless some way can be found to initiate strangers temporarily into the local clubs without payment of prohibitory fees. The fact that hotel values have not collapsed indicates a sly expectation that some way will be found to dodge the law.

But public opinion at large in quiet, staid, orderly Belgium has turned against the gaming table, and even if Ostend manages to "save its face," as the Chinese say, its day as the successful rival of Monte Carlo and the world's most glittering gambling joint has apparently passed forever.

Whereat Neighbor France smiles contentedly. France never could see much harm in gambling, and has had few scruples about it in any form, from national lotteries down to licenses for green-covered

tables in the back rooms of corner grogeries.

One result, therefore, of the great reformation in Belgium will be a boom at Dieppe, for that is the public gambling place nearest to London, and directly in the path of the money-laden American tourists who swarm between London and Paris each season. Unless the picturesque French town is too greedy it is likely to become one of the most famous resorts in Europe before long, and its "petits chevaux" will bring in more money than the town authorities will know how to manage.

At present those "petits chevaux" make monkeys of the folk who hazard their francs on them, for the chances against the bettor are 12½ per cent, whereas in the games at Monte Carlo the margin in favor of the bank is only 1½ per cent or in many cases 1 per cent. I have watched the players at the Dieppe Casino with close attention on several occasions, and would risk a guess that not one person in ten leaves the place a winner. The piles of coin in the croupier's boxes grow as steadily as in the cashier's till of a great dry goods store and change color from the white of silver to the yellow of gold as regularly as if the transformation were effected by machinery.

In all probability Dieppe will take advantage of the situation and widen her net with rouge et noir and baccaret, but at present the nine little horses suffice to drain her visitors of their pocket money. They run in concentric circles on a board eight feet in diameter, and the six-inch iron steed that stops nearest to the line after making half a dozen circuits is the winner. Stretching out from the miniature racetrack are the long, green-clothed tables, with sections corresponding to the number of the horses, and other sections for combination bets. You place your franc on No. 8, the track-master turns his crank and proclaims, "Les jeux sont faites!" in tones that sound like the last despairing wail of a swimmer whose strength is gone. A moment of breathless silence while the little horses tear around in their circles, then the track master's despondent sing-song, "Numero huit." There is an instant crash of the croupier's rakes and the sound of the clinking of silver, as if hundreds of money bags were being shaken madly, and there on the green cloth before you is your franc, with six others added unto it. That looks like good business, and not until later in the evening does it appear that even if one sticks to the lowest limit and bets only a franc at a time the sport costs on the average 20 cents for each five minutes, which proves expensive in time.

Dieppe's casino is a handsome, roomy building, that stretches along one of the finest bits of beach on the Normandy coast. Back of it are the summer homes of many of the French aristocracy, and shining white in the hot sun and against the blue sky is a row of hotels that charge fierce prices in the short, gay season, and are moderate enough just before or just after. A few miles back is the magnificent ruin of Argues, perched high on a table land, whence narrow windows in the great fortress or from the top of its thick, mossy covered walls you can look for miles up and down the fertile valley far below. Bathing in the morning, a siesta in the afternoon and gambling or loafing at the Casino in the evening are about all that one can do, or that one wants to do, in the hot days when Dieppe is at its gayest.

Further up the coast is noisier and less aristocratic Boulogne, and here, too, is a casino and the "petits chevaux" and bets for any sum you like, whereas at Dieppe the limit is 5 francs. Boulogne, too, has an eye on Ostend and is hoping eagerly for the downfall of the Belgian Vanity Fair.

CURTIS BROWN.

AT THIRTY-FIVE.

At the age of 35 a woman is usually either a philosopher or a fool. Fool or philosopher, according to the way she views the past and faces the future.

At 35—neither young nor old—her position corresponds somewhat to that of the lanky, growing girl, who is too old to play childish games but too young to do up her hair and put on long gowns. It is the awkward transition period. The woman of 35 has come to the parting of the ways. Having reached the outskirts of youth, she has not yet crossed the border into middle age.

Now, verily youth is a beautiful thing, and no woman parts with it willingly. Yet, willy nilly, part with it she must at 35. The fool is she who struggles and fights against the inevitable. The philosopher she who looks the situation squarely in the face and accepts it—if not cheerfully, at least with an imitation of cheerfulness that passes muster for the genuine article. She looks into her mirror, sees the mature figure, the double chin, perhaps, and says to herself:

"The arrangement of my hair is too girlish; makes me riduculous. It's time for me to give up baby-ribbon effects."

We all know the woman on the wrong side of 30 who refuses to admit her age, who regards herself and wishes others to regard her as something between dear 20 and delightful 25. Her mirror might shout "35" every time she gazed into it, yet she would go on making the toilet of 20. Having ears, she refuses to hear. Having eyes, she sees—yes, she sees the lines and crows' feet, but puts them to rout, so far as she is able, with massage, cold creams and complexion brushes. Those which will not be smoothed away by such means she conceals under powder, rouge and one of those flimsy veils which make the plain woman pretty and the pretty woman a vision of loveliness.

In war paint and feathers she looks young—quite young to the casual observer. But this woman is a cheat, a fraud, and her youthful appearance a delusion. Although she elects herself a member of youth, she cannot, without making her efforts nil, "go in" for tennis, golf, rowing, bathing, and all those forms of outdoor sports which make Miss Twenty fascinating in spite of disheveled tresses. Those same sports make Miss Thirty-five a fright.

Poor fool! She can't be young, and she won't be old, so—after the fashion of the donkey who starved to death between two haystacks—she has neither the pleasure of the one nor the other.

The fool—being a fool—cannot understand that the philosopher has pleasures, and that they are broader, deeper, better, and more satisfying than those which should appeal only to honest but frivolous young womanhood.

It goes without saying that the philosopher has brains, and these she uses with profit to herself and others. Merely by turning her thoughts to other things than those connected with personal adornment, her mind and character broaden. She becomes less selfish — noble. She thinks and reasons more. Books that were once read carelessly take on a deeper meaning. The beauties in nature and art she feels and enjoys as never before. Sorrow and suffering of all kinds awaken her sympathy and pity. She condemns less readily, and forgives more quickly than in the days when impulse—good-natured or otherwise — alone governed her actions. She finds friends—true, staunch friends—in both sexes, and in all sorts and conditions of men, women and children.

Our philosopher has not yet forgotten the joys and woes of childhood. She still feels an interest in gay and effervescent youth. She glances backward at the past. Ah, how quickly the years have flown! Then toward the future. And the glance reveals old age in a new light, and makes her tender and pitiful to the physical in-

firmities which so often come with declining years. She is still at the zeneth of life. But the sunrise was so short a time ago, and the sunset will be equally as quick in coming. Though the one was beautiful, the other may be glorious. Of all her friends this philosopher appreciates most those who are wiser and older than herself, for she finds them the most unselfish, the most helpful of any.

Should this woman be pitied? Not at all. The very cream of life is hers.

So be wise all ye women of 35. Give up trying to cheat the years. At best it is a nerve-disturbing, soul-destroying, heart-breaking business. Give it up. You will lose little and gain much, for you will exchange brass for pure gold. Stand aside for younger sportsmen—or women, rather. Take yourself out of the field while you may do so with dignity. Why wait to be thrust forth amid jeers and laughter?—*Los Angeles Sunday Times.*

HE MET HIS MATCH.

"Never cross question an Irishman from the old sod," advises one of the foremost railroad attorneys of the age. "Even if he does not think of an answer he will stumble into some bull that will demoralize the court and jury, and whenever a witness tickles a jury his testimony gains vastly in its influence.

"Yes, I'm speaking from experience. The only witness who ever made me throw up my hands and leave the courtroom was a green Irishman. A section hand had been killed by an express train and his widow was suing for damages. I had a good case but made the mistake of trying to t[illegible] the main witness inside out.

"In his quaint way he had given a graphic description of the fatality, occasionally shedding tears and calling on the saints," quotes the *Detroit Free Press.* "Among other things he swore positively that the locomotive whistle was not sounded until after the whole train had passed over his departed friend. Then I thought I had him.

" 'See here, McGinnis,' said I, 'you admit that the whistle blew?'

" 'Yis, sor; it blewed, sor.'

" 'Now, if that whistle sounded in time to give Michael warning, the fact would be in favor of the company, wouldn't it?"

" 'Yis, sor; and Mike would be tistifyin' here this day.' The jury giggled.

" 'Never mind that. You were Mike's friend, and you would like to help his widow out; but just tell me now what earthly purpose there could be for the engineer to blow that whistle after Mike had been struck.'

" 'I preshume thot the whistle wore for the nixt mon on the thrack, sor.'

"I left and the widow got all she asked."

LATEST TROUSERS RECIPE.

"A year or two ago," said a young man to a friend, "I spent a few weeks at south coast watering places. One day I saw a machine which bore the inscription 'Drop a penny in the slot and learn how to make your trousers last.' As I hadn't a great deal of money I thought an investment of a penny to show me how to save the purchase of a pair of trousers would be small capital put to good use, so I dropped the required coin in and a card appeared. What do you suppose it recommended to make my trousers last?"

"Don't wear 'em, I suppose."

"No."

"What did it say?"

"Make your coat and waistcoat first."

SAND.

I observed a locomotive in the railroad yard one day
It was waiting in the roundhouse where the locomotives stay;
It was panting for the journey, it was coaled and fully manned,
And it had a box the fireman was filling full of sand.

It appears that locomotives cannot always get a grip
On the slender iron pavement 'cause their wheels are apt to slip;
And when they reach a slippery spot their tactics they command
And to get a grip upon the rail they sprinkle it with sand.

It's about this way with travel along life's slippery track,
If your load is rather heavy and you're always sliding back;
So, if a modern locomotive you completely understand,
You'll supply yourself at starting with a good supply of sand.

If your track is steep and hilly, and you have a heavy grade,
And if those who've gone before you have the rails quite slippery made.
If you ever reach the summit of the upper table-land,
You'll find you'll have to do it with a liberal use of sand.

You can get to any station that's on life's schedule seen,
If there's fire beneath the boiler of ambition's strong machine.
And you'll reach a place called Flushtown at a rate of speed that's grand
If for all the slippery places you've a good supply of sand. —Sel.

THE OLD FAMILIAR FACES.

Oh, those old familiar faces, how they linger in the mind,
How the recollection of them 'round our mem'ry is entwined.
There's a man in Keene, New Hampshire, who was going to die for sure,
Till he swallowed sixteen bottles of Dead Shot Consumption Cure;
Down in Linden, Alabama, lives that well-know blacksmith's wife,
Who, by means of Piller's Pellets, found the pathway back to life.
Both their faces linger with us, and refuse to go away,
For in many advertisements we can see them every day.

Up in Tuttle, Colorado, dwells a famous miner who
Lost two legs in one explosion. Jones's Life Saver pulled him through.
And in Manly Junction, Iowa, two section hands reside,
Who, by using Johnson's Tonic, keep this side the Great Divide.
In the town of Burton, Texas, is a man who the M. D.'s
Said would die in twenty minutes. Ransom's Oil cured his disease.
We can see them all before us, though they live so far away,
For their portraits all are printed in the papers every day.

And the babies! Ah! the babies, sitting on their mothers' knees,
While the man who takes the picture smiles and says, "Look pleasant, please!"
How the pudgy little features are engraved upon our hearts,
Though the little ones that own them live in very distant parts.
What a wilderness of babies we have lately come to know,
Who've been saved by foods and mushes, clear from Maine to Mexico.
We have never heard their wailing nor their prattle and their play,
But we know them, for we've seen them in the papers every day.

—*Portland Oregonian.*

HIS FERVENT HOPE.

Mrs. Sleepyize—"Henry, the alarm clock just went off."

Mr. Sleepyize — "Thank goodness; I hope th' thing 'll never come back."—*Columbus (O.) State Journal.*

SOME RESOLUTIONS.

I've made some resolutions, not so many—
just a few,
For I have a certain habits I've decided
to eschew,
I've made a memorandum of some things
I shouldn't do,
And marked the path of rectitude I'll
struggle to pursue.

* * * * * *

I have resolved to smoke no more—I'll
give tobacco up;
I'll cease to look with longing eyes upon
the tippler's cup;
I'll even shut my toddy, as a kind of en-
t'ring wedge,
And in a year, perhaps, I'll be prepared to
sign the pledge.
I seldom swear, but I've resolved, hence-
forth, to use no word
That may not, by the most refined, with-
out offense be heard.
I never play a game of chance, because I
have no skill,
But for the sake of conscience I've re
solved I never will.
I'll be more economical about the way I
dine,
And I've resolved to worship less at pleas-
ure's gilded shrine.
I'll go to church on Sundays, once again
I'll learn to pray.
And I've a list of creditors that I've re-
solved to pay.
If these few resolutions I can keep, a
snug amount
I'll have in hand next year, wherewith to
start a bank account.
And I've resolved, if I should live this
model upright life,
To take unto myself a sweet and charm-
ing little wife.
But there may come temptations that I
cannot well resist,
So one more resolution must be added to
the list;
Therefore it is hereby resolved that,
should I chance to fall
And break one resolution, I'll resolve to
break them all.

—Lawrence Porcher Hext in Leslie's Weekly.